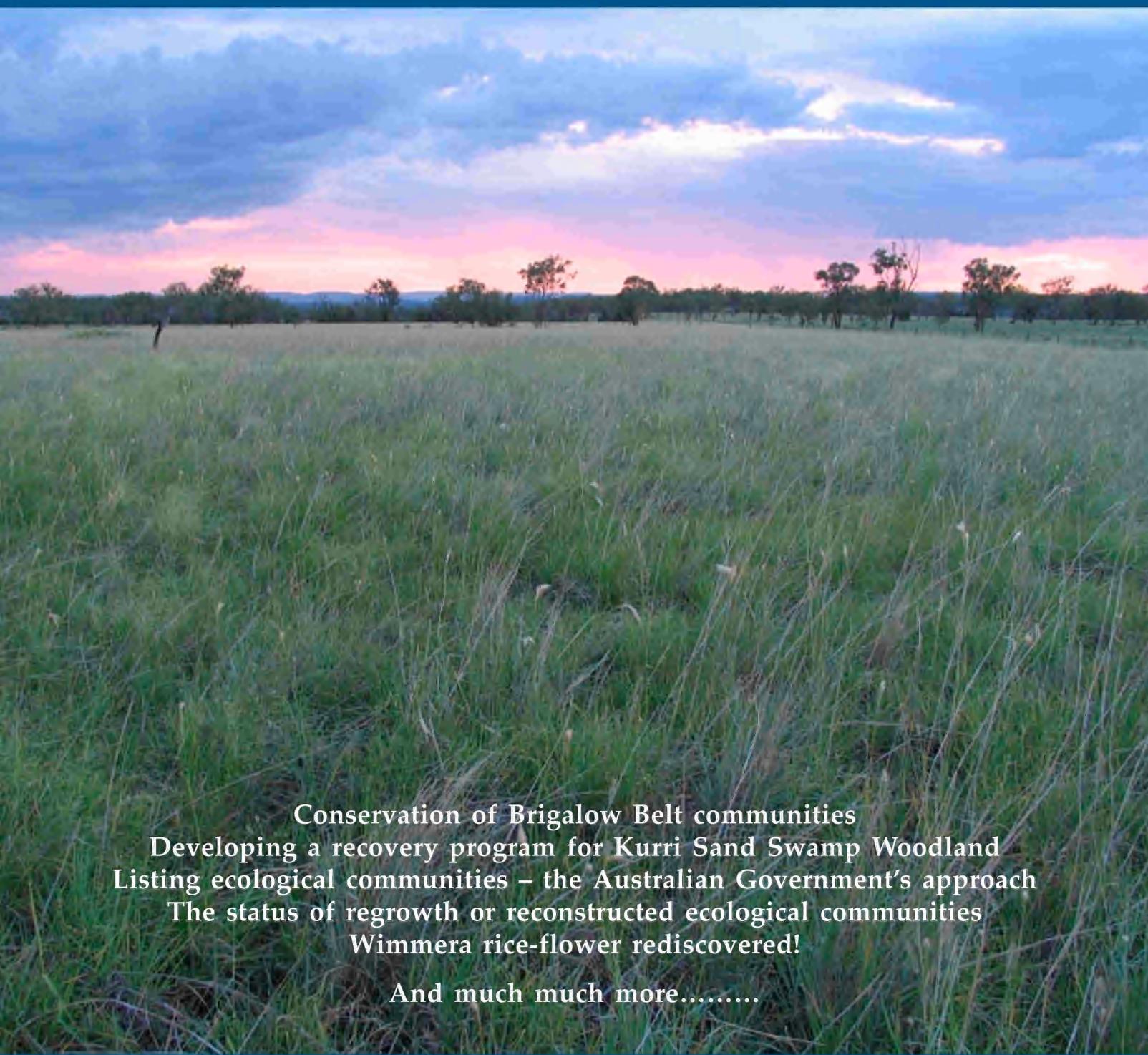


Australasian Plant Conservation

BULLETIN OF THE AUSTRALIAN NETWORK FOR PLANT CONSERVATION

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Conservation of Brigalow Belt communities

Developing a recovery program for Kurri Sand Swamp Woodland

Listing ecological communities – the Australian Government's approach

The status of regrowth or reconstructed ecological communities

Wimmera rice-flower rediscovered!

And much much more.....

Special Theme: THREATENED ECOLOGICAL COMMUNITIES

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"To promote and develop plant conservation in Australia"

Contributing to Australasian Plant Conservation

Australasian Plant Conservation is a forum for information exchange for all those involved in plant conservation: please use it to share your work with others. Articles, information snippets, details of new publications or research, and diary dates are welcome. **The deadline for the March-May 2006 issue is Monday 6th March.** The March-May issue will be on the special theme of 'Fire for Conservation', however general articles may also be accepted.

Authors are encouraged to submit images with articles or information. Please submit images as clear prints, slides, drawings, or in electronic format. Electronic images need to be at least 300 dpi resolution, submitted in at least the size that they are to be published, in tif, jpg or gif format.

Please send typed or handwritten articles, no more than 2 A4 pages (or 1100 words), by fax, mail, email, or on disk. If sending by email, please send as a MS Word (2000 compatible) or rich text format attachment to: anpc@deh.gov.au.

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Front cover: Roadside areas such as this stock route in Central Queensland support some of the best examples of bluegrass grassland.
Photo: Don Butler

Cover design: Siobhan Duffy.
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President's report

Judy West

*Centre for Plant Biodiversity Research
CSIRO Plant Industry*

The essence of this report was presented at the Annual General Meeting held at the end of November, and as such is largely a summary of ANPC's activities during the past twelve months. The ANPC has consolidated its position in the increasingly active conservation-space in Australia during the past year. This has primarily been at the interface between the science arena, the policy makers and land managers, and the on-ground practitioners. We have seen some exciting times and events taking us into new directions.

The **high quality training workshops** organised and hosted by the ANPC during this past year have contributed significantly to the scientific level of information provided to practitioners. Around 350 people have been trained during the translocation and rehabilitation workshops during this year. The feedback from each of the workshops has been extremely complimentary on the quality of presentations, as well as the relevance of the content.

A series of '**Translocation of Threatened Plants' workshops**' was held responding to user demand, including a request by NSW Environmental Trust as a follow-up to the revised Translocation Guidelines, which they supported. Two to three ANPC committee members have provided the core of presentations for each of these workshops and the formula of incorporating real case scenarios into the program seems to have hit on a winning combination. I would like to express gratitude on behalf of all of us in the ANPC to those members who have contributed so much of their time and energy to the success of these workshops.

A series of **rehabilitation workshops** was hosted by ANPC in regional NSW under the able organisational abilities of Sally Stephens, and with contributions from those with local experience. Again these have had very positive response.

The support ANPC has managed to bring on board for running these training sessions has been extremely encouraging. It is clear there is a demand to increase the scientific level of information being provided to those of our community responsible for on-ground management and conservation. I wish to acknowledge the generous backing and cooperation of all the various organisations and agencies concerned.

Australasian Plant Conservation It is exciting to see the content of the Bulletin expanding to incorporate more substantial articles, for which we have received positive feedback. In addition, the concept of publishing issues of APC dedicated to a particular theme seems to have met with approval. Feedback from members on these issues and other suggestions would be very helpful. We have managed to secure small amounts of funding to sponsor the publication of various issues of APC, and will be proactively seeking further support during the next year.

National Conference 2005 – September 25-28 in Adelaide

Theme: *Plant Conservation in times of change – dealing with extremes of climate, threats and policy.* Jointly hosted by South Australia's Department of Environment and Heritage and ANPC. The National Conference was a great success and provided an excellent opportunity for networking and learning from others – this meeting provides a pretty unique venue bringing the practitioners together with researchers and policy makers, and certainly stimulates thoughtful debate and discussion.

The number of participants in the National Conference was slightly disappointing (just over 100), even though those who attended certainly felt it was an excellent conference. The ANPC Committee members have spent some time working through the efficacy of the national conference format in the crowded plant conservation space. One outcome of our deliberations was the idea of trying a different style of meeting, perhaps in the form of

Have you renewed your membership for 2006?

The year you have paid up to appears on the flysheet above your address.
If you need to renew, please complete a membership renewal form ([download from www.anbg.gov.au/anpc](http://www.anbg.gov.au/anpc)) and return it to the ANPC National Office.

a one-day forum with a specific topic (perhaps the ‘ANPC Annual Forum’) together with one day of workshops. The large number of science and conservation related meetings around Australia now provides a greater challenge to holding a meeting that will attract the mix of conservation interests that has always been ANPC’s remit. Those with whom I’ve discussed this feel it is worth pursuing – further feedback would be helpful.

ANPC’s **staff members**, Pam Strickland holding the office together, and Sally Stephens, project officer for the environmental grants and workshop organiser, have both done a fantastic job supporting our organisation. I greatly appreciate their dedication to ANPC and the commitment they have shown to keeping the organisation buzzing.

We have invested in a new **accounting system** for the office and Pam has undertaken training with MYOB to set up the system, greatly assisted by our new Treasurer Jim Crennan. This will establish a much clearer view of our financial situation.

The National Committee has worked well together and individual contributions have been outstanding. The ANPC should be proud of the dedication of its elected office bearers. I would like to see greater input from a broader range of the committee members in the next year, and we are already off to a good start with a planning meeting scheduled for late February.

I take this opportunity to sincerely thank the retiring members of the National Committee – Gerald Mueller, John Arnott and Andrew Smith – for their long term commitment to the organisation, which I am sure will continue under different guises. Particular thanks are due to Ged for taking the responsibility of the Treasurer’s position and trying to handle the finances in slightly

difficult times. I am sure all ANPC members would wish me to thank Tricia Hogbin, who has stepped down from the Secretary’s position, for making such a major contribution over the past few years. It is fortunate for us that Tricia has remained on the committee and is easing the new Secretary into the position.

The enthusiasm for ANPC is reflected in a number of new members elected to the national committee at the recent AGM. It is with pleasure that we welcome Tom Celebreeze, Jim Crennan, Deanna Marshall and Paul Gibson Roy as new members. Also, Helena Mills, previously a committee member, was appointed as Secretary. Jim Crennan has taken the Treasurer position and is bringing his finance and accountancy skills to the ANPC. The team making up the national committee brings together an outstanding range of expertise and experiences that the organisation should capitalise on into the future.

The ANPC is extremely grateful to the ANBG and the Director Robin Nielsen and Deputy Director Jim Croft for the hospitality and accommodation that the Gardens provides for ANPC. This support is invaluable for us to deliver the activities and functions that we have been able to pursue.

It is with sadness that I report the death of one of our past Committee members and a strong advocate for plant conservation. David Given lost his battle with cancer on November 27 after a career of serving the conservation community. A tribute to his life and career can be found on page 26. David was a long-term member of the ANPC from its foundation in 1991, and was a consistent source of encouragement and international experience for plant conservation in both New Zealand and Australia. David will be missed in both our countries and around the world.

Special offer for ANPC members!

The ANPC has recently affiliated with the quarterly journal *Ecological Management & Restoration* (EMR). Affiliation does not change either organisation but simply provides links between them to enhance the two-way communication between practitioners and researchers working in sustainable management and sound restoration of ecosystems.

As a result of the affiliation, ANPC members can now subscribe to EMR at a special discount rate of \$54.45 per year (normally \$72.60). Please note: this is only available to individual members (not to groups or organisations).

To subscribe, simply fill in the relevant box on the ANPC membership form, which can be downloaded from the ANPC website at <http://www.anbg.gov.au/anpc/index.html> or obtained from the ANPC office on request.

Conservation of endangered grasslands in the Brigalow Belt – are things looking up for Bluegrass downs?

Don W. Butler

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The sight of lush natural grasslands excited Australia's European explorers as well as the pastoralists that followed closely in their footsteps. Nowadays pastoralists tend to prefer exotic pastures, but lush native grasslands can still excite discerning eyes. One such grassland type - "Bluegrass (*Dichanthium* spp) dominant grasslands of the Brigalow Belt Bioregions (north and south)" - is now listed as an endangered ecological community under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Features of Bluegrass grassland

Queensland Bluegrass (*Dichanthium sericeum*) is a very widespread and variable summer-growing grass prominent in sub-humid tussock grasslands. Early botanists and pastoralists called these grasslands "bluegrass downs" to distinguish them from the semi-arid "Mitchell grass downs". These grassland types share a broad ecotone running from west of Clermont in central Queensland to Moree in northern NSW. Along this ecotone, a run of wet years increases dominance by Bluegrass, while drier years increase the prominence of Mitchell grasses. These shifts highlight the dynamic nature of grassland species composition (Blake 1938).

Bluegrass grasslands are generally dominated by several perennial tussock grasses including *Dichanthium sericeum*, *Aristida leptopoda*, *Panicum* spp, *Bothriochloa erianthoides*, *Thellungiella advena*, *Astrebla elymoides* and *A. lappacea*. After prolonged heavy grazing, annuals such as Flinders Grass (*Iseilema* spp) can be very prominent. Growing among and between the grasses are legumes (e.g. *Desmodium campylocaulon*, *Neptunia gracilis* and *Vigna* spp) as well as prostrate herbs (e.g. *Commelina ensifolia*), robust forbs (e.g. *Amaranthus* spp, *Hibiscus trionum*, *Sida* spp and *Verbena* spp), saltbushes (e.g. *Atriplex* spp.) and daisies (e.g. *Camptacra barbata*, *Cymbonotus* spp, *Picris* spp, *Vittadinia* spp). The diversity of life forms and species can be astounding.

The endangered ecological community (Bluegrass grasslands EEC) initially had two main centres in Queensland: the basalt derived alluvium of the Condamine River in southeast Queensland (the Darling Downs), and the basaltic plains north and south of Emerald in central Queensland (the Central Highlands). Unlike grasslands in the Central Highlands, those in the Darling Downs support



Grazed Bluegrass grassland (RHS of fence) with large areas of bare ground and increased annual and unpalatable perennial grasses. Photo: Don Butler

species typical of temperate grassy ecosystems (Fensham 1999). A third centre occurred in NSW on the eastern Barwon River plains near Moree.

About 386,000 ha of native grassland were present on the Darling Downs when pastoralists first moved in; less than 4,000 ha remain today. A similarly catastrophic history has also reduced the Moree plains Bluegrass grassland to scattered fragments. The Central Highlands support the majority of the remaining Bluegrass grasslands EEC in the Brigalow Belt - an estimated 166,000 ha of an original area greater than 500,000 ha.

Managing grazing

Substantial changes in grassland species composition probably occurred when pastoralism commenced, and grazing is now a key grasslands management issue. Many of the endangered or vulnerable plants in bluegrass grasslands - e.g. Belyando Cobblers Peg (*Trioncinia retroflexa*), Austral Cornflower (*Stemmacantha australis*), Austral Toadflax (*Thesium australe*), Hawkweed (*Picris evae*) and King Bluegrass (*Dichanthium queenslandicum*) - are considered to be sensitive to grazing, and are now restricted to roadsides and other sporadically grazed areas. Some grazing sensitive species, such as King Bluegrass, are highly palatable and valuable to graziers if they can manage to keep them.

Poor grazing management can cause dominance by unpalatable grasses and is also a major risk factor for invasion by weeds such as Parthenium (*Parthenium hysterophorus*). Poor grazing management that reduces the value of grassland as pasture increases the risk of conversion to cropping or exotic pasture. Encouraging good grazing management will produce substantial biodiversity benefits, and is also likely to improve productivity and sustainability of grazing enterprises.

Heavy grazing can also impact on the faunal habitat value of grasslands by reducing the structural diversity provided by grass tussocks, herbage and litter in inter-tussock spaces. Species dependent on this structural diversity include quail and other prey favoured by an array of raptors. Bluegrass grasslands are also habitat for four reptiles endangered in Queensland: Five Clawed Worm-Skink (*Anomalopus mackayi*), Grassland Earless Dragon (*Tymanocryptis pinguicolla*), Grey Snake (*Hemiaspis damelii*) and the Retro Slider (*Lerista allanae*).

Well managed grazing appears to be compatible with biodiversity maintenance in Bluegrass grasslands. Recommended best practice includes regular wet season spelling from grazing, and limiting total grazing pressure to maintain substantial cover of perennial tussock grasses. Grasslands seem particularly prone to overgrazing when they are fenced into mixed paddocks with other land types. Achieving best-practice grazing management may require extra fencing or other infrastructure (for which graziers are encouraged to seek financial assistance under the Australian Government's 'Envirofund' or Queensland's 'Biodiversity Incentives Tender'). Stewardship payments are available for landholders who wish to manage their grasslands to benefit biodiversity. Financial support including rate relief can also be accessed via voluntary conservation agreements (e.g. Nature Refuge Agreements in Qld).

The threat of habitat destruction

Bluegrass grasslands continue to face considerable threat from habitat destruction, mainly through conversion to cropping or exotic pastures (including *Leucaena leucocephala* plantations), mining (especially coal), and road widening or



Queensland Bluegrass (Dichanthium sericeum), a characteristic species of the Brigalow Belt grasslands. Photo: Don Butler



The Lined Earless Dragon (Tymanocryptis lineata) in Central Queensland uses fissures in the cracking clay soils of Bluegrass grasslands for shelter and foraging. Photo: Don Butler

other infrastructure development. Managing these threats will require regulation, or at least effective application of existing regulatory instruments such as the EPBC Act.

Protection through the EPBC Act

The Bluegrass grasslands EEC listing is based on the Regional Ecosystem classification and mapping produced by Queensland's Environmental Protection Agency. Regional Ecosystems (REs) are vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil (Sattler and Williams 1999).

The EEC was defined to include four of seven bluegrass REs in the Brigalow Belt:

- *Dichanthium sericeum* and/or *Astrebla* spp grassland on alluvial plains (RE 11.3.21)
- *Dichanthium sericeum*, *Astrebla* spp grassland on Cainozoic clay plains (RE 11.4.4)
- *Dichanthium sericeum* grassland on Cainozoic igneous rocks (RE 11.8.11)
- *Dichanthium sericeum* grassland with clumps of *Acacia harpophylla* on Cainozoic fine-grained sedimentary rocks (RE 11.9.12)

Grassland that contains little Bluegrass and is infested with weeds (particularly perennial exotic grasses) is disqualified from the Bluegrass grassland EEC on the basis of poor condition. However low Bluegrass density alone shouldn't exclude an area, because continuous grazing or dry climatic conditions can temporarily reduce its abundance. The above REs, rather than the abundance of Queensland Bluegrass, better define the EEC. However under the EPBC Act, grassland condition is 'self-assessed' (e.g. by the property owner) to determine whether a grassland area is part of the listed EEC; this is a major weak point in the Act's regulation, given the dynamic nature of the community.

Recovery planning

We need to minimise the loss of remaining grasslands and simultaneously move to improve their management and condition. A recovery plan is currently being prepared for the Bluegrass grassland EEC, and will provide background

on its ecology, management and threats. The plan will also recommend actions aiming to maximise our chances of maintaining the environmental and pastoral values of Bluegrass grasslands for generations to come.

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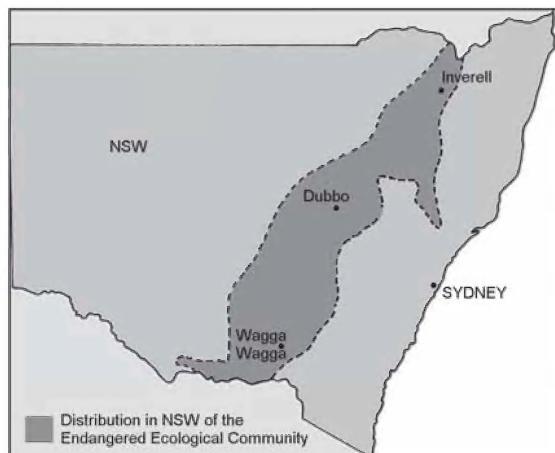
Grassy Box Woodland Conservation Management Network

Toni McLeish

Coordinator, Grassy Box Woodland Conservation Management Network, NSW. Email: toni.mcleish@environment.nsw.gov.au

Australia is home to more than one million species, many of which are found nowhere else in the world. About 85 per cent of flowering plants, 84 per cent of mammals and more than 45 per cent of birds are endemic, that is they are only found in Australia.

Less than 4% of Grassy Box Gum Woodlands across the western slopes of NSW remain intact. These woodlands support around twenty-one threatened species. The geographic area that these woodlands once dominated is aptly named the NSW wheat sheep belt.



Distribution in NSW of the endangered ecological community – Grassy Box Woodlands.

White Box/Yellow Box/Blakely's Red Gum Grassy Woodland has been drastically reduced in area and highly fragmented because of clearance for cropping and pasture improvement. The remaining remnants of this community are degraded as a consequence of disturbance. Some remnants of these communities survive with the trees partly or wholly removed by post-European activities, while other remnants survive with the trees largely intact but ground layers degraded to varying degrees through grazing or pasture modification.

Remnants are subject to varying degrees of threats including further clearing for cropping, pasture improvement and urban development. The condition of remnants is compromised further by firewood cutting, increased livestock grazing, weed invasion, inappropriate fire regimes, soil disturbance and increased nutrient loads. Overall there is a degradation of the landscape in which remnants occur due to soil acidification, salinity, and loss of connectivity between remnants.

I would like to clarify what it means when a whole ecological community's survival is at risk and to tell you about a network of hundreds of land managers across the state who share an interest in looking after the remaining Grassy Box Gum Woodlands.

Changes to the landscape and native habitat as a result of human activities have put many of these unique species at risk. Over the last two hundred years many species of plants and animals have become extinct. For the other species of plants and animals, whose survival is questionable, a process is in place, which activates legislation leading to specific actions. Species at risk are listed as vulnerable, threatened or endangered after the careful consideration of a scientific committee made up of a group of experts. This listing activates a range of management and conservation measures, including a recovery plan, that sets out the research and management actions necessary to stop the decline of, and support the recovery of, this endangered ecological community.

The ecological community characterised by the assemblage of species dominated by the tree species White Box, Yellow Box and/or Blakely's Red Gum, was listed as endangered by the State of NSW in 2003, and is currently being considered for listing under the Federal EPBC Act. This community is found on relatively fertile soils of the lower slopes on the tablelands and western slopes of NSW. Grass and herbaceous species generally characterise the ground layer. Shrubs are generally sparse or absent.

A significant part of the existing recovery plan for Grassy Box Woodlands in NSW is to promote conservation of this endangered ecological community on private land, as very little exists in conservation reserves because of its fragmented status.

The Grassy Box Woodland Conservation Management Network started in 1998 when a group of keen people led by a private consultancy group, Community Solutions, saw a need to raise awareness of the plight of Grassy Box Woodlands. The initial project 'Taking Action Now' focused on Grassy White Box Woodlands, but when the state listed White box, Yellow Box and Blakely's Red Gum, the focus broadened and a partnership was formed with the then National Parks and Wildlife Service. Since 1998 the Federal government, with the support of the State, has funded the Grassy Box Woodland Conservation Management Network. Over the past 7 years the network has maintained its original function of raising awareness, but has expanded into areas of information-sharing and education, through its newsletter, website and email discussion group. The network forms partnerships with many organisations across seven catchments, including Catchment Management Authorities, educational institutions, research groups, Landcare groups and individuals, to provide field days, forums and workshops, determined by the members' needs and interests. The network consists of a diverse range of people all with an interest in saving the remaining Grassy Box Woodlands, each at varying degrees on the learning curve. We currently have 689 members, 368 of whom are private land managers.

As the network project officer I share my passion for life-long learning and my concern for the species associated



Grassy Box Woodland Conservation Management Network membership sign. Photo: Toni McLeish

with Grassy Box Woodlands as I travel the western slopes of NSW. I have been to many fabulous sites and seen many rare species, each with unique habitat requirements, and been inspired by land managers who are finding it hard to survive themselves, but still do what they can to save this endangered community.

I suggest next time you are heading north in a car, don't go via the coast but go inland and travel the slopes of NSW, be inspired and then think about what you can do to contribute to saving Grassy Box Woodlands.

For more information: www.gbwcmn.net.au



Kurri what?? Developing a recovery program for Kurri Sand Swamp Woodland

Tricia Hogbin

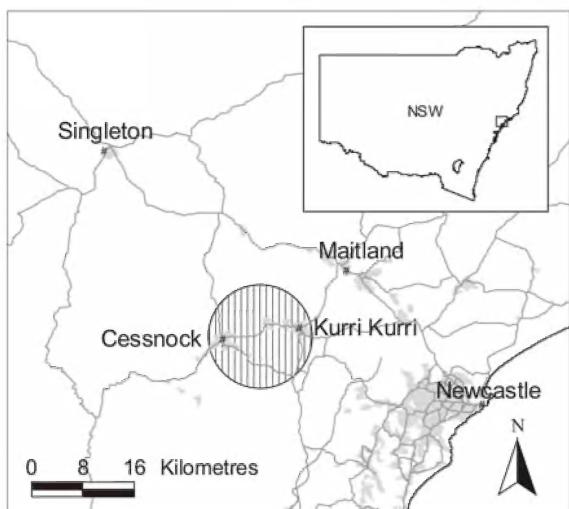
Department of Environment and Conservation (NSW), Newcastle. Email: tricia.hogbin@environment.nsw.gov.au

Kurri Sand Swamp Woodland (KSSW) is the name given to a threatened ecological community restricted to soils that occur over sand deposits in the Kurri Kurri and Cessnock areas in the Lower Hunter Valley, NSW. This ecological community is defined largely by its substrate and structure and therefore species composition may vary amongst sites. The canopy of KSSW is typically dominated by various combinations of the following taxa: *Angophora bakeri*, *Corymbia gummifera*, *Eucalyptus* sp. aff. *agglomerata*, *Eucalyptus capitellata*, *Eucalyptus fibrosa*, *Eucalyptus parramattensis* subsp. *decadens*, *Eucalyptus punctata*,

Eucalyptus racemosa, and *Eucalyptus resinifera*. Understorey vegetation is dominated by a range of shrubs typical of sand environments.

Why is it threatened?

Due to its specific habitat requirements, KSSW is likely to have always had a relatively restricted distribution. Habitat loss due to clearing for urban and industrial development has further reduced its distribution, with available information suggesting as much as 50 per cent of the



General extent of occurrence of Kurri Sand Swamp Woodland.

The community has a very restricted distribution, with a linear range of only 20km, within the Kurri Kurri - Cessnock area of the Lower Hunter Valley, NSW.

woodland may have been cleared, with only approximately 2500 hectares remaining. Remaining areas are threatened by continued habitat loss and habitat degradation due to frequent fire, inappropriate hazard reduction activities, physical disturbance (e.g. rubbish dumping, trail bike riding), weed invasion, and changes to drainage conditions and nutrient levels.

Given the small area of KSSW remaining and the continued threats to the community, it was listed as an endangered ecological community under the NSW *Threatened Species Conservation Act 1995* (TSC Act) in 2001. The community is currently not listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), although one of the actions within

the forthcoming recovery plan is to nominate the community as a threatened ecological community under the EPBC Act.

What is being done to conserve it?

To help prevent extinction of this ecological community, the NSW Department of Environment and Conservation (DEC) commenced a recovery project in early 2005, and, in collaboration with a KSSW Recovery Team, has prepared a draft recovery plan that outlines what needs to be done and by whom to conserve the woodland. The draft recovery plan will be released for public comment in early 2006.

The overall objective of the recovery plan is to maintain and improve the current extent, condition, and ecological function of KSSW across the community's entire pre-European settlement distribution. Specific recovery objectives include:

- gain greater insight into the distribution, floristics, and variance within KSSW and to investigate the relative significance of KSSW remnants;
- provide public authorities with information that assists in conserving and managing KSSW;
- raise awareness of KSSW and facilitate community involvement in the recovery program;
- identify and minimise the threats operating at sites where KSSW occurs and ensure appropriate ecological restoration where necessary and feasible;
- initiate potential conservation of KSSW on private property;
- promote research and monitoring projects that will assist future management decisions, and
- broaden the legislative protection afforded KSSW.

Year 1 of recovery project: lessons learnt

Drawing close to the end of year one of the recovery project, what are the main lessons learnt regarding developing a recovery project for a threatened ecological community (or indeed any threatened entity)?

A recovery plan with nobody to implement it is not very useful....

Engaging stakeholders early has been invaluable. At least six different state government departments have agreed in principle to implement actions within the plan (the draft plan is currently awaiting formal public authority endorsement prior to exhibition). At least three different community groups are actively contributing towards objectives and five different agencies/organisations are contributing funds towards recovery actions. What a collaborative effort!



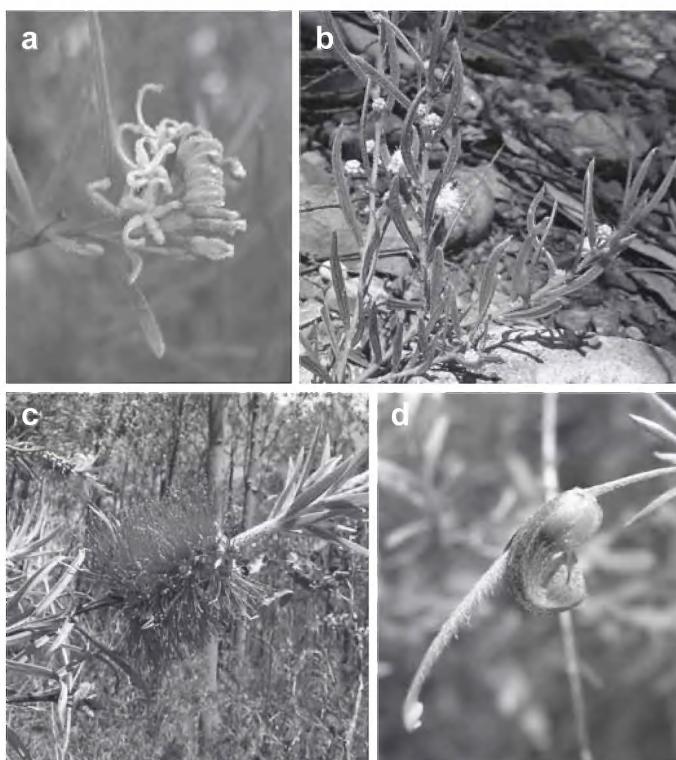
*Kurri Sand Swamp Woodland with a low open canopy of *Angophora bakeri* and *Eucalyptus parramattensis* subsp. *decadens* and a diverse shrubby understorey. Photo: Tricia Hogbin, DEC.*

Stakeholders were engaged early, with a stakeholder forum held in the first few months of the project. The forum increased awareness that the recovery program had commenced; ensured all relevant stakeholders, programs and resources were identified; and provided insight into likely interest, support, and involvement in the recovery program.

A KSSW Recovery Team was subsequently established to guide the preparation and implementation of the recovery plan. The recovery team contains representatives from the DEC, Cessnock City Council, Forests NSW, Hunter-Central Rivers Catchment Management Authority, Department of Lands, the Roads and Traffic Authority, the Rural Fire Service, and also includes representatives from environmental consulting, research, industry, and the local community. The recovery team has been invaluable in ensuring actions identified within the plan integrate with existing projects and approaches where possible, and has ensured implementation of the recovery plan is a collaborative effort.

A recovery plan with no \$\$\$'s for implementation is even less useful...

One of the main successes of the first year of the recovery program was obtaining funding to implement priority actions. Sourcing funding can be very time consuming and is often left until well after a plan is complete – having funding secured prior to completion of a plan ensures actions will actually be implemented.



The woodland provides important habitat for numerous rare and threatened plant species including, (a) Grevillea parviflora subsp. parviflora, Photo: Tricia Hogbin, DEC (b) Acacia bynoeana, Photo: Colin Driscoll (c) Callistemon linearifolius, Photo: Stephen Bell and (d) Grevillea montana, Photo: Tricia Hogbin, DEC.

Almost all actions within the KSSW Recovery Plan already have funding secured, and for those that don't (e.g. a Teacher Resource Kit for threatened species and ecological communities of the Lower Hunter), funding will be actively sought in 2006, with particular attention focused on potential industry funding.

A priority objective of the plan is to clarify the distribution and classification of KSSW. Recent surveys have revealed that the floristics of KSSW is more complex and varied than originally thought. There are a number of observable combinations of canopy and understorey species and it appears this variation in floristic composition reflects variation in soil type (specifically the relative proportions of sand and clay) and the related drainage patterns (Bell 2004). This leads to a number of questions relevant to the implementation of the recovery program. Are we only dealing with one community? Are there some variants that deserve higher priority for recovery efforts? A lack of a reliable vegetation map and a reliable classification of KSSW not only hinders recovery plan implementation, it also makes decision making regarding strategic planning and development assessment difficult.

Consequently, various government departments and industry with an interest in being able to identify the distribution and relative significance of KSSW remnants were approached, with the Hunter-Central Rivers Catchment Management Authority, the NSW Premiers Department and Cessnock City Council agreeing to sponsor the project. This collaborative project has now commenced, with Eastcoast Flora Survey undertaking survey, classification and mapping.

Future directions

Four additional recovery programs within the Lower Hunter region will commence in 2006, with recovery programs commencing for the State and Commonwealth listed threatened species: *Eucalyptus parramattensis* subsp. *decadens*, *Acacia bynoeana*, *Persoonia pauciflora* and the endangered ecological community/endangered population Weeping Myall – Coobah – Scrub Wilga Shrubland of the Hunter Valley (also known as Hunter Valley Weeping Myall Woodland, and Hunter Catchment endangered population of *Acacia pendula*). Rather than establish four new recovery teams, which would likely have very similar membership, the KSSW Recovery Team will evolve into the Threatened Flora of the Lower Hunter Recovery Team, picking up a few additional members along the way to ensure all relevant experts and stakeholders are represented.

The KSSW Recovery Plan will be placed on public exhibition early 2006. In the meantime, priority actions will continue to be implemented, in collaboration with various stakeholders and the Recovery Team.

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Listing ecological communities – the Australian Government's approach*

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The EPBC Act

The *Environment Protection and Biodiversity Conservation Act 1999* (the Act) is the Australian Government's primary environmental legislation, and includes mechanisms for the protection and recovery of ecological communities threatened with extinction.

The Act allows any person to nominate ecological communities for listing as nationally threatened. All nominations are assessed by the Threatened Species Scientific Committee (the Committee), who make a recommendation to the Australian Government Minister for the Environment and Heritage (the Minister). The Minister then makes the decision whether or not to list an ecological community as threatened under the Act.

Protection

Under the Act, any action that is likely to have a significant impact on a matter of national environmental significance, such as a listed ecological community, must be referred to the Minister for a decision on whether the action requires approval. The onus on making referrals lies with the person who intends to undertake the action. Consequently, the definition of an ecological community listed under the Act must not only be scientifically and legally rigorous, but also needs to be cast in such a way that an intelligent lay-person could be expected to recognise the listed ecological community on the ground.

Recovery

Under the Act, a recovery plan must be prepared for every listed ecological community. Pending the development and implementation of a recovery plan, the Committee has begun providing 'conservation advice' to the Minister, in addition to listing advice, outlining actions that can be taken to conserve and recover the ecological community until a recovery plan is developed. The Department of the Environment and Heritage also develops information products, such as information sheets, newsletters and maps, to inform people about the ecological community, why it is listed and what they can do to help.

Defining nationally threatened ecological communities

Previously, definitions of ecological communities were very general and primarily described their pre-1750 state. Little consideration was given to how degradation has influenced

the current state of ecological communities. The process of defining listed ecological communities was recently refined to better account for their current condition and regional variation. This approach seeks to optimise environmental outcomes. It focuses legislative protection on those areas in the best condition and facilitates recovery by encouraging landholders to rehabilitate those degraded areas that have the greatest potential for recovery.

The assessment of ecological communities for listing can be a particularly complex process. Defining an ecological community is rarely simple, as many cannot be delineated easily by simple rules or sharp boundaries. Definitions are especially difficult for those ecological communities that have a broadscale distribution, that exist in a range of natural states or ecotones, or that intergrade with adjacent ecological communities.

In the past, definitions of ecological communities included general information on species composition, vegetation structure, abiotic features such as soil type and landform, and location. However, definitions were largely silent on how degradation may shift an area away from the undisturbed state of the ecological community. As a result, previous definitions of listed ecological communities included areas of degraded vegetation, bringing these areas within the protection provisions of the Act.

Loose definitions can potentially have consequences that are contrary to the intended conservation outcomes of the Act. Firstly, as higher quality areas are frequently small in size and extent, their importance can be masked by the inclusion of large degraded remnants. Their loss can appear less significant when considered in the context of a larger area of occupancy of the listed ecological community as a whole. Secondly, land managers may feel obliged to refer actions that impact upon listed patches which are degraded, and which are subsequently found not to be significant. Such referrals present an administrative burden to land managers and the government. More importantly, they are likely to hinder the acceptance of the Act by rural communities, who play a vital role in contributing to the conservation of ecological communities on private land.

A new approach to defining nationally threatened ecological communities

In response to these concerns, the Committee organised a workshop in June 2004 with experts familiar with the problems of defining ecological communities. As a result of this workshop, the Committee proposed refinements to their



(left to right) Figure 1. Good condition patch of Yellow Box - Blakely's Red Gum Grassy Woodland. These grassy woodlands are being assessed for listing under the EPBC Act using this approach. Figure 2. Degraded Grassy White Box Woodland.

Photos: Helena Mills

approach to defining threatened ecological communities under the Act. The Minister subsequently endorsed the new approach.

This approach incorporates information about condition and regional variation within the description and definition of threatened ecological communities. Definitions now identify three or more condition categories for each ecological community listed.

1. High quality patches. These areas make up the listed threatened ecological communities and are subject to the protection provisions of the Act (e.g. Figure 1). As only patches in good condition form the basis for ecological community listings, the area of occupancy of each listed ecological community is less extensive than under the previous approach because they would no longer be 'inflated' by the inclusion of degraded areas that would be unlikely to trigger the protection mechanisms of the Act.

2. Degraded but recoverable patches. These areas are degraded to such an extent that they are no longer considered part of the listed ecological community but, given resources and time, could be recovered. They may also be important for providing connectivity between higher quality areas and as habitat for wildlife. However, as they are not part of the listed ecological community, actions involving these patches will not trigger the protection provisions of the Act. Consequently, the exclusion of degraded areas from listing will minimise the unnecessary regulatory burden placed upon landholders but, at the same time, will not inhibit the adoption of appropriate conservation measures. These patches remain eligible for recovery planning and support from national environmental funding schemes, such as the Natural Heritage Trust.

3. Irrecoverable patches. These are not only considered to be too degraded to be part of the listed ecological community, but also too degraded for viable recovery effort (see Figure 2). This condition category acknowledges that, given limited resources, conservation effort should focus on achievable goals such as protecting the most intact and recoverable remnants.

Condition categories and definitions are determined separately for each nominated ecological community by a combination of methods, including examination of the scientific literature, extensive consultation with experts and public consultation. A key feature of this approach is to hold technical workshops with ecologists and relevant land management experts to devise a robust definition of the ecological community as well as identifying appropriate condition classes. The attributes defining condition classes are developed to be straightforward and applicable by land managers. Prior to listing, the outcomes of each technical workshop are tested in the field. The ecological attributes used to determine condition categories could include: overstorey and ground layer species composition, native species richness, native species cover, extent of weed infestation and tree density.

In addition to the inclusion of condition classes in the definition of ecological communities, the Committee also decided that the new approach should 'regionalise' the definition of broadscale ecological communities, where necessary. This takes into account the fact that broadscale ecological communities tend to cover a range of climatic zones and substrates and can display considerable variation in species composition. Regionalisation allows the definition to capture local variations, making it easier for a land manager to reconcile the ecological communities they manage with the description of the listed ecological community.

Further information

Further information is available by calling the Department of the Environment and Heritage on 1800 803 772, or on their website:

- *Environment Protection and Biodiversity Conservation Act 1999:* www.deh.gov.au/epbc/index.html
- Threatened species and ecological communities: www.deh.gov.au/biodiversity/threatened/index.html

*Please note, the content of this paper has been presented by the author and others at a number of conferences, and will also be published in the proceedings of the 2005 Stipa (the Australian native grass association) conference: www.stipa.com.au.

Vine thicket communities of the Brigalow Belt Bioregion of Queensland

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Vine thicket communities, often known colloquially as 'Softwood scrub' or 'Bottle-tree scrub' (from the characteristic emergent *Brachychiton* spp), extend through much of the Brigalow Belt Biogeographic Region of Queensland and northern New South Wales. These communities represent the driest form of rainforest occurring in eastern Australia, and are found in areas receiving 650–900 mm annual rainfall. They occur on well-drained sites with fertile loams, clay loams and earths derived predominantly from basic volcanics and fine-textured sedimentary rocks.

The communities are generally low, with a relatively open canopy averaging 8–12 m in height, although emergent trees may reach 20 m or more. The most common emergents are Narrow-leaved Bottletree (*Brachychiton rupestris*) and Broad-leaved Bottletree (*B. australis*), while Ooline (*Cadellia pentastylis*) is sometimes prominent. Belah (*Casuarina cristata*), Brigalow (*Acacia harpophylla*) and several eucalypts (*Eucalyptus albens*, *E. orgadophila* and *E. camophageana*) are also common.

The tree and shrub layers are generally quite diverse, and distinguishable floristic patterns are closely related to climatic attributes. Floristic (and structural) diversity decreases with lower, more seasonal rainfall regimes, leading to stands dominated by Bonewood (*Macropteranthes leichhardtii*) or Narrow-leaved Backhousia (*Backhousia angustifolia*).

Spinescent or thorny species are prominent in the shrub or low tree layers, including Currant Bush (*Carissa ovata*), *Capparis* spp and *Bursaria* spp. The ground layer is generally sparse and heavily dependent upon seasonal conditions. The most frequent and often the only significant grass is Hookey Grass (*Ancistrachne uncinulata*), while other ground plants include sedges (*Cyperus* and *Carex*), ferns *Cheilanthes*, *Pellaea*, *Einadia* spp and two species of Acanthaceae (*Pseuderanthemum variabile* and *Brunoniella australis*).

Lianas are a characteristic feature of vine thicket communities. They include ephemeral species such as *Passiflora aurantia* and *Diplocyclos palmatus*, and *Cissus opaca*, which dies back seasonally to a tuber.

Vine thickets have long been a target for agricultural development, mainly because they generally occupied more fertile soils, but also because they produced very little woody regrowth after clearing, in contrast to the dense regrowth encountered in communities such as brigalow and eucalypt woodlands and open-forests. During the Fitzroy Basin (Brigalow) Land Development Scheme of the 1960s and 1970s, large areas of vine thicket were cleared by pulling and burning, particularly in the Central Highlands district. Broad-scale clearing of remnant vine thicket communities in Queensland was banned under the *Vegetation Management Act 1999* (Qld), but 17,000 ha were cleared in the six years prior to the Act coming into force (1995–2001).

Fourteen regional ecosystems (REs) dominated by vine thicket vegetation have been identified across nine land zones within the Brigalow Belt Bioregion (Sattler and Williams 1999) (see Table 1), and their pre-clearing and remnant extent mapped at 1: 100,000 scale by Queensland Herbarium botanists. Of an estimated original area of 1.064 million ha, less than one-quarter remained in 2001 (Accad *et al.* 2003), predominantly on moderate to steep terrain. Under the *Vegetation Management Act 1999* (Qld), seven vine thicket REs have been listed as endangered and seven as of concern; ten of these are included in the Semi-evergreen Vine Thicket ecological community listed as endangered nationally under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth).



Vine thicket with emergent Bottletree (*Brachychiton rupestris*) and Ooline (*Cadellia pentastylis*), north of Injune. Photo: R.W. Johnson

Table 1. Vine thicket regional ecosystems in the Brigalow Belt Bioregion

| Land Zone and description | Regional Ecosystems and descriptions | Status |
|--|---|-------------|
| Zone 2 – Quaternary coastal dunes and beaches | RE 11.2.3 – Low microphyll vine thicket (“beach scrub”) on sandy beach ridges | E |
| Zone 3 – Alluvial plains | RE 11.3.11 – Semi-evergreen thicket on alluvial plains | E |
| Zone 4 – Cainozoic clay plains | RE 11.4.1 – Semi-evergreen thicket on Cainozoic clay plains | E |
| Zone 5 – Cainozoic remnant surfaces | RE 11.5.15 – Semi-evergreen thicket on Cainozoic sand plains/remnant surfaces | E |
| Zone 8 – Cainozoic igneous rocks | RE 11.8.3 – Semi-evergreen vine thicket on rocky, often steep hillslopes RE 11.8.6 – Bonewood (<i>Macropteranthes leichhardtii</i>) thicket RE 11.8.13 – Semi-evergreen vine thicket and (low) microphyll vine forest on areas of low relief. | E E E |
| Zone 9 – Cainozoic to Proterozoic fine-grained sedimentary rocks | RE 11.9.4 – Semi-evergreen vine thicket on fine-grained sedimentary rocks RE 11.9.8 – Bonewood (<i>Macropteranthes leichhardtii</i>) thicket on fine-grained sedimentary rocks. | E E |
| Zone 10 – Cainozoic to Proterozoic medium to coarse-grained sedimentary rocks | RE 11.10.8 – Semi-evergreen vine thicket in sheltered habitats on medium to coarse-grained sedimentary rocks | – |
| Zone 11 – Old (Mesozoic to Proterozoic) sedimentary rocks with various degrees of metamorphism and folding | RE 11.11.5 – (Low) microphyll vine forest ± <i>Araucaria cunninghamii</i> on metasediments RE 11.11.18 – Semi-evergreen vine thicket on lowlands on metasediments RE 11.11.21 – Semi-evergreen vine thicket on serpentinite | – E – |
| Zone 12 – Old (Mesozoic to Proterozoic) igneous rocks predominantly granitoids | RE 12.12.4 – Semi-evergreen vine thicket and (low) microphyll vine forest on old igneous rocks | – |

The most restricted of all vine thicket communities – vine thickets on serpentinite (RE 11.11.21) – covers a total area of 1,692 ha. Regional ecosystems 11.2.3, 11.3.11 and 11.4.1 also cover less than 2,500 ha each. The most extensive vine thicket ecosystem is 11.9.4, covering 67,500 ha. This however is only 12% of its estimated pre-clearing extent which amounted to more than half the total area of vine thicket within the Brigalow Belt region.

Almost 75% of remaining vine thicket communities is held under freehold or leasehold tenure (98,000 and 93,500 ha respectively). Only 18% (46,000 ha) is reserved within national parks, with a further 14,000 ha in state forests. In the Central Highlands, the Carnarvon, Expedition and Palmgrove national parks protect 25,900 ha, or more than half the total reserved area. Other significant areas occur within Bunya Mountains, Dipperu, Goodeulla, Mt Archer and Rundle Range National Parks and in Coominglah and Carminya State Forests.

Although remnant vine thicket vegetation is now protected from large-scale clearing, major threats still remain. The brigalow and other woodland and forest communities which once surrounded many vine thickets seldom carried hot fires, but have been



Interior of vine thicket, Boomer Range, north-west of Rockhampton. Photo: R.W.Johnson



*Vine thicket remnant, Springsure district, showing fire damage and invasion by Buffel Grass (*Cenchrus ciliaris*). Photo: R.W.Johnson*

replaced by dense pastures dominated by highly flammable grasses, particularly Buffel Grass (*Cenchrus ciliaris*). Regular, often high intensity fires are used to manage woody regrowth in these pastures and over time have affected severely roadside and paddock remnants. Many remnants are also under increasing pressure from grazing cattle and wallabies – the Black-striped Wallaby (*Macropus dorsalis*), which is endangered in New South Wales, may reach densities of hundreds or even thousands per hectare in remnants adjoining crops and pastures in central and southern Queensland.

A national recovery plan is being prepared for the vine thicket communities of the Brigalow Belt and Nandewar bioregions of Queensland and New South Wales, but steps are already being taken to ensure the long-term future of these communities. Grants were made available for fencing of several key remnants during the late 1990s and further incentives are being offered under a Biodiversity Incentives Tender program through the Queensland Environmental Protection Agency and other initiatives by regional Natural Resource Management bodies.

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What status do regrowth and reconstructed expressions of endangered ecological communities have?

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The Commonwealth and some State Governments have laws aimed (amongst other things) to help protect endangered ecological communities. Ecological communities (such as Littoral Rainforests on NSW coastal bioregions) formally listed under these laws are often remnants of vegetation types whose original distribution has been significantly reduced because of activities such as agricultural and/or urban development, mining etc.

Under recent changes to the *NSW Threatened Species Conservation Act (1995)* it is now officially mandatory to consider endangered ecological communities when undertaking an Assessment of Significance (previously referred to as an 8-part Test) for a proposed development or activity. Two of the issues that need to be addressed in making decisions as part of these impact assessment processes:

- are individuals of component species or instances of the ecological community actually there? This is a scientific judgement requiring objective evidence, and is easier to apply to a species than to a community; different scientists may differ in their assessment, and
- will the loss of some individuals or some parts of the community threaten the integrity of whole species or the viability of the entire community in this Bioregion? This requires subjective scientific judgement on the projection of past trends into the future.

Large areas of many endangered ecological communities have been cleared or are extremely degraded. In the absence



Senescent Banksia woodland that had regenerated after coastal sandmining. Photo: Lee Andresen

of the original disturbance activities, some highly degraded or cleared areas may regenerate naturally and occur in the landscape as regrowth vegetation. Other areas may require extensive planting of component species. These remnants occur in the landscape as ‘reconstructed’ communities.

How will such regrowth and ‘reconstructed’ expressions of endangered communities be assessed under NSW conservation law? Is the law (e.g. NSW Scientific Committee, 2004) intended to protect mature remnants of endangered ecological communities only, or does it also protect juvenile, recovering communities?

A case study of naturally regenerating Littoral Rainforest in northern NSW (Andresen 2005; 14th NSW Coastal Conference 2005), located in an area proposed for community amenity infrastructure, highlights current ambiguities about how regrowth communities are viewed. Our group argued that both mature stands of Littoral Rainforest and recovering sites need conservation in tandem. Others argued that juvenile, recovering communities were not intended for protection under NSW conservation law.

Reconstruction of Littoral Rainforests is a core element of coastal ecological restoration practice that is rewarded, supported and encouraged (Buchanan 1999; NSW Department of Land and Water Conservation, 2001). However, there is great ambiguity about the future status of reconstructed endangered ecological communities as part



Natural regrowth of Littoral Rainforest species on the floor of the Banksia woodland. Photo: Lee Andresen

of future impact assessment. Guidelines are urgently needed to ensure that the conservation efforts of community groups like ours are appropriately included in impact assessment processes.

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Volunteers plant Littoral Rainforest species on a cleared Bitou Bush/Lantana zone. Photo: Lee Andresen

Editor note: The NSW Department of Environment and Conservation will be releasing Assessment of Significance Guidelines in the near future. Keep an eye on www.environment.nsw.gov.au/threatspec.

Evaluating vascular epiphyte abundance and distribution patterns in critically endangered rainforest

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Introduction

Complex notophyll vine forest ('Type 5b' forest), has recently been scheduled as *critically endangered* (Qld EPA Regional Ecosystem 7.8.3, DEH 2005), resulting largely from a combination of its naturally limited distribution and subsequent fragmentation associated with agricultural land use. The majority of this forest type occurs on nutrient rich basalt soils across a variety of elevations on the Atherton Tablelands in north Queensland (the Wet Tropics). Rainforest associations described as 'complex' do not occur further west than Type 5b forests, as the amount of rainfall received at sites on the Tablelands declines westward. Key characteristics of the Type 5b forest include its occurrence on basalt soil, a multi-layered canopy ranging in height from 25 to 45 m and a distinct shrub layer (Tracey 1987). This forest has several deciduous tree species and a relatively small average canopy leaf size (7.5-12.5 cm long) compared to other complex forests in the Wet Tropics. Each of these characteristics is thought to be related to its receipt of

relatively low amounts of rainfall. In its original description, epiphytes were considered 'rare' in this complex forest, compared to forests in higher rainfall areas (Tracey 1987).

Epiphytes are plants rooting on the surface of tree trunks or branches without harming the host tree. Epiphytes contribute to species diversity, biomass production, litter fall and water retention, and provide substrate for nitrogen fixing bacteria (Benzing 1998, Munoz *et al.* 2003). Further, epiphytes provide important resources including forage sites and shelter to many canopy animals such as birds (Cruz-Angon & Greenberg 2005), pythons (Freeman *et al.* 2005), and invertebrates (Ellwood *et al.* 2002). Several large epiphyte species occur in Type 5b rainforests (Figure 1), including *Asplenium australasicum* (Bird's Nest Fern), *Drynaria rigidula* (Basket Fern), *Platycerium bifurcatum* (Elkhorn Fern), and *Platycerium superbum* (Staghorn Fern). In other forest ecosystems, epiphytes have been noted for their functional significance, especially in their contribution to maintaining forest humidity and moisture regimes (Holscher *et al.* 2004), and their potential role as climate



*Figure 1. An example of *Platycerium superbum* and *Asplenium australasicum* occurring in Wongabel State Forest, a remnant patch of Type 5b forest where epiphytes are considered 'rare' compared to other forest types. Photo: Jason Cummings*

change indicators (Benzing 1998). With a 1°C temperature increase and a 10% reduction in precipitation, Type 5b forest is expected to decline by 20% (Hilbert *et al.* 2001). Large epiphytes may be of special importance in mediating and monitoring the expected changes in Wet Tropics forest distributions under climatic changes.

Preliminary Surveys

The dearth of information regarding eastern Australian epiphyte species' abundances and distribution patterns is surprising, with a recent notable exception (Roberts *et al.* 2005). If this is an artifact of modern literature data-basing techniques please let me know! Our preliminary surveys of large epiphytes in a remnant of Type 5b forest yielded some interesting patterns (Cummings *et al.* submitted). Across the four species of epiphytes sampled, they were more abundant than canopy trees (1.7 epiphyte individuals per tree), but only occurred on 57% of trees sampled. The notion of rarity has partly been quantified, in that the epiphytes are as rare [or common] as their hosts. When our surveys are extended to include small epiphytic species, it will likely be that on a 'number of individuals per unit area' basis, the trees will be described as 'rare' in comparison to the epiphytes. The fact that they occur on only half of the trees

indicates that their distribution is clumped, and may be related to the fact that the presence of a large epiphyte makes the environment more conducive to the establishment of other epiphytes.

As has been found elsewhere, abundance of large epiphytes increased with tree size (diameter and height). Host trees from the Meliaceae family yielded the highest abundance of epiphytes, which in Type 5b forests includes the deciduous *Melia azedarach* and *Toona ciliata*, suggesting that the seasonal increased availability of light, nutrients and moisture may favour establishment and growth of large epiphytes. Of final note was the 10-times difference in abundance between the epiphyte species *Drynaria rigidula* and *Platycerium bifurcatum*, the former being the most abundant, but not described as occurring in Type 5b forests when first described (although the latter was, Tracey 1987), suggesting a potential shift in community composition since the forests were first formally described.

Next Steps

As is often the case in science, our preliminary surveys yielded more enticing questions than answers. We are now focusing on addressing questions regarding whether epiphytes are more abundant and have a different height distribution on deciduous trees compared to evergreen trees, and the influence of edge effects and concordant canopy microclimatic variables (Figure 2) on epiphyte communities. Our aim is to build an understanding of epiphyte species distributions and community patterns with respect to micro-climatic conditions, such that longer-term changes can be monitored, and the potential role of epiphytes in mediating those changes can be examined.

Management Implications

Several important considerations stem from the preliminary survey results. Caution is warranted in the use of the word 'rare' when appropriate quantification has not been undertaken. Local community members involved in restoration of these forest types do not consider epiphytes common, based on the published descriptions for Type 5b communities. Epiphytes are, therefore, generally not considered in restoring these forest communities, despite their relatively high abundance with respect to canopy trees, and their likely functional importance. The catch-22 of being 'rare' is that of functional importance; with relatively low numbers compared to other forest types, each large epiphyte in Type 5b forests may play a proportionally greater role in forest function compared to that in forests where they are more abundant. This is further exacerbated by the landscape context of Type 5b forests, occurring at the western extent (or low rainfall areas) of complex forest communities in the

wet tropics, where mediation against drying may be a crucial role played by large epiphytes.

Epiphytes are a functionally important aspect of complex forest ecosystems, and may provide a ‘canary in the cage’ for monitoring the impacts of climate change on terrestrial forest systems. In Australia we almost have a clean research slate with respect to counting epiphytes, and noting their relationships with micro-climatic, forest structural and landscape variables. By documenting abundance and

habitat requirements for a variety of easily identified epiphytes, we can begin to monitor the predicted impacts of climate change. Further, if we can gain an understanding of their potential functional significance, we can use them to build resilience to climate change impacts in our restoration plantings.

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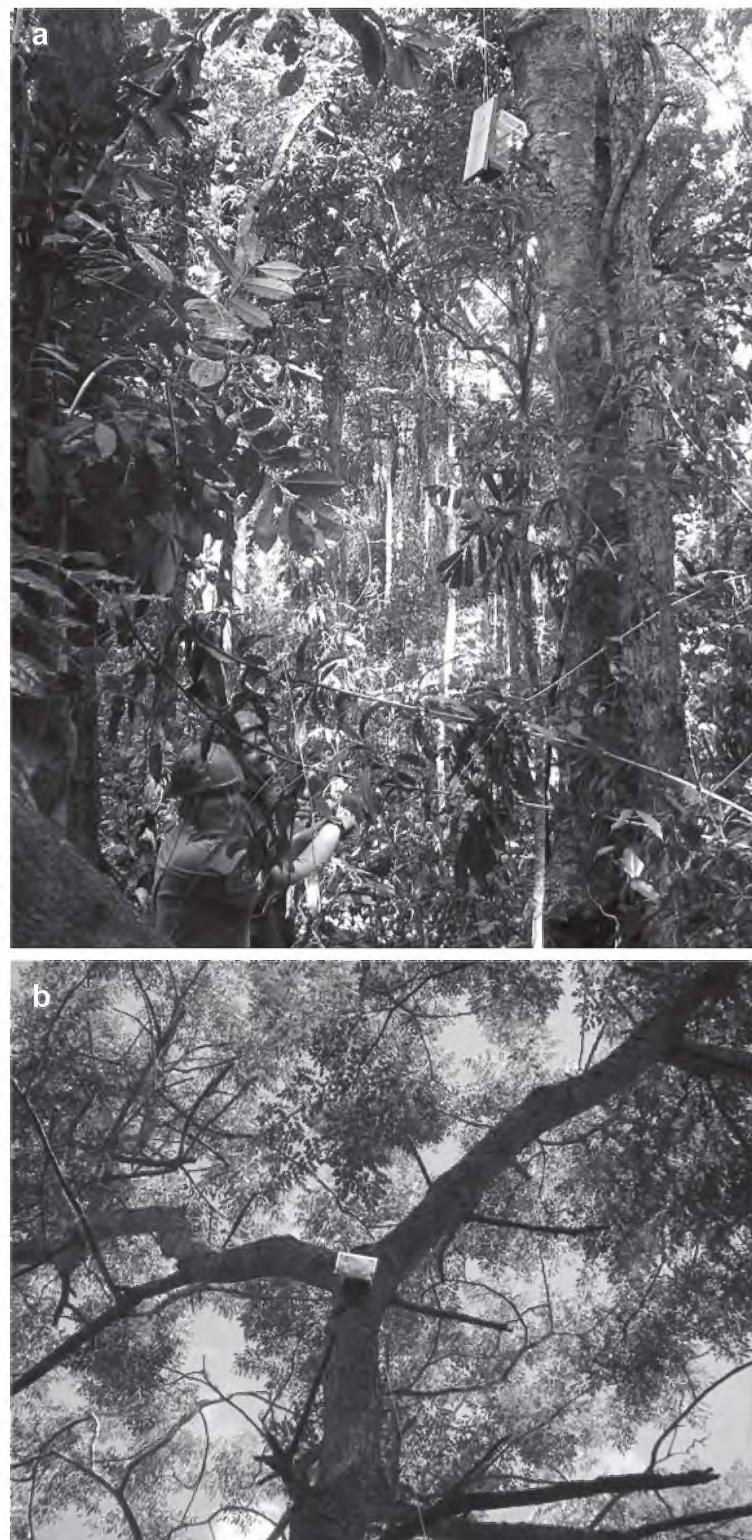


Figure 2. Hoisting a Hobo® temperature and humidity logger into the canopy of 5b forest (a) (Photo: Rachel Martin), and the logger in place (b). Photo: Michaela Swanson

Creation of plant habitat by desert mammals

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Animals can influence plants and other animals directly through predation, competition, or facilitation (by providing environmental conditions that favour their growth and/or survival). Animals can also have indirect effects on other species merely through their activities. One indirect effect is when animals move resources such as soil around in the landscape, altering and creating habitat, an activity that has recently been called 'ecosystem engineering' (Jones *et al.* 1994).

Beavers (*Castor* sp) are a classic example of ecosystem engineers. Construction of their lodges dramatically alters landscape hydrology, creating habitat for plant and animal species that would not normally survive in these areas. Other examples of ecosystem engineers range from the small molluscs that sculpt the sea bed (Gutiérrez *et al.* 2003), to termites that alter the nutrient balance of semi-arid environments (Dangerfield *et al.* 1998), and Grizzly Bears (*Ursus arctos horribilis*), whose foraging and consumption of Glacier Lilies (*Erythronium grandiflorum*) actually benefits lily populations (Tardiff and Stanford 1998).

Ecosystem theory suggests that the impact of engineering is likely to be greatest in areas where resources are limited. Nowhere are resources more limited than in desert environments. It is not surprising, therefore, that many animals from arid and semi-arid Australia have been identified as ecosystem engineers. Below are three examples where the engineering effects of mammals are known to influence landscapes, and are thought to have flow-on effects to other organisms.

Echidnas foraging pits: ecological 'hotspots'

Echidnas (*Tachyglossus aculeatus*) are one of the most ubiquitous animals in continental Australia. While foraging for mainly subterranean insects, Echidnas excavate large amounts of soil using their powerful limbs. Echidna diggings range from simple nose pokes and shallow pits, to deep digs and bull-dozing (Rismiller 1999), and in the semi-arid woodlands the mass of soil turned over is estimated to be in excess of 7 t/ha (Kwok 2005).

A recent study of Echidna foraging pits in western NSW has shown that the pits are substantially cooler, the soil less dense, and the pits trap considerably more water and litter than adjacent non-pit surfaces. Concentrations of nitrogen, sulphur and phosphorus in the pits are lower, soil respiration higher, and diversity and abundance of microarthropods (mites and collembola) higher compared with non-pit soils (Mensinga 2005). These studies show conclusively that Echidna foraging pits act as resource traps, contributing to the patchiness necessary for the functioning of arid and semi-arid ecosystems.

Given that Echidna diggings create 'hotspots' in a mostly infertile landscapes, we would expect the pits to have flow-on effects to other biota. For example, pits are likely to hold more water and therefore to improve the germination and establishment of vascular plants during droughts. They may also support plants with more nitrogen in their tissues, making them more digestible for native browsers, a largely unknown phenomenon and the subject of ongoing research. They could conceivably sustain population of small mammals and reptiles during dry periods.



Pits trap organic matter and seed and become safe sites for plant germination. Photo: David Eldridge

Prairie Dogs, Bison and Burrowing Owls

Prairie Dogs (*Cynomys* spp) have long been considered a pest species by many ranchers in the western United States because of the perception that they compete for forage with cattle and sheep (Cid *et al.* 1991). However, they are now largely viewed as an important species necessary for the functioning of healthy rangelands (Kotliar 2000).

Prairie Dogs live in large colonies ('towns') where they maintain a low-stature, nutrient-rich grazing lawn around their colonies. The lawns attract the North American Bison (*Bison bison*) that preferentially graze them. Colonies are also habitat for Burrowing Owls (*Athene cunicularia*) which nest within the unused burrows. The altered plant habitat around the colonies changes the populations of ground-dwelling invertebrates which differ substantially on and off the colonies (Kretzer and Cully 2001).

Prairie Dog burrows are also refugia for a wide range of animals including the critically endangered Black-footed Ferret (*Mustela nigripes*), which preys upon young Prairie



A wombat burrow on the Nullarbor Plain. Burrowing alters the plant community structure around the burrows.

Photo: David Eldridge

Dogs. Given the marked effect of Prairie Dogs on the physical structure of the landscape, it is likely that there are a greater number of flow-on effects to other biota in the landscape (Kotliar 2000).

Bilbies: substantial soil movers from arid Australia

The Greater Bilby (*Macrotis lagotis*) is the quintessential ecosystem engineer in arid Australia, and is known to have major effects on soil processes at both patch and landscape scales. Bilbies excavate huge quantities of soil while foraging, and rates range from 12.7 t/ha on sandy dunes to 2.6 t/ha on clay gibber soils (James 2004), though these rates include diggings made by Burrowing Bettong (*Bettongia lesueur*).

Bilbies dig mostly in the soft sand of the dunes, destroying the thin surface crust that tends to shed water to the gibber areas at the bottom of the slope. Their digging has the

potential to interrupt the natural flow of water to the gibbers, where the water-holding capacity is greatest and where plant production is greatest. Research currently underway at Arid Recovery in northern South Australia aims to study how the pits dug by Bilbies might develop into favourable sites for plant growth and survival by changing the way that resources are held in the patches.

Bilbies also excavate the roots of hopbushes (*Dodonaea* spp) in search of root-borne grubs, and prior to European settlement may have helped to suppress invasive shrubs and promote an open woodland (Noble 1995). Bilby burrows were undoubtedly used routinely by other animals such as the Woma Python (*Aspitites ramsayi*) and Echidna, and as refugia by small mammals and reptiles during droughts. It is highly likely, therefore, that the loss of bilbies from large areas of continental Australia has had dramatic impacts on plant and small animals, and consequently, on ecosystem function.

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Bilby at the entrance to its burrow in a sand dune. Photo: Arid Recovery

'Presumed Extinct' species rediscovered!

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Pimelea spinescens subsp. *pubiflora* was presumed to be extinct, until very late in 2005 that is, following the discovery of a population on a roadside in the Wimmera region of Victoria. A chance observation from the road led to the subsequent identification of the species, for which the last specimens recorded are from the Dimboola and Borung districts in 1901. The subspecies has since been assigned the common name of Wimmera Rice-flower.

The Wimmera Rice-flower is one of two subspecies of Spiny Rice-flower (*Pimelea spinescens*), which are both restricted to Victoria. The other subspecies, Spiny Rice-flower (*Pimelea spinescens* subsp. *spinescens*) is classified as Critically Endangered under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 and is listed as Threatened under the Flora and Fauna Guarantee Act 1988. No longer 'presumed extinct', the conservation status of the Wimmera Rice-flower will need to be reviewed.

The flowers are the critical features that separate the subspecies. The Wimmera Rice-flower has flowers that are hairy on the outer surface whereas those of the Spiny Rice-flower are quite hairless. The Wimmera and Spiny Rice-flowers typically bloom in mid winter, which is in contrast to most other grassland species, with a profusion of small creamy yellow flowers. The spine-tipped nature of the stems distinguishes both the Wimmera and Spiny Rice-flower from all other Rice-flower species.

As a result of recent recovery work on the Spiny Rice-flower, the physical appearance of the Wimmera Rice-flower was familiar when viewed from the road. It was October, so the plants had finished flowering, but the shrubby nature and



Sarah Kelly admiring the newly discovered population of Wimmera Rice-flower. Photo: Neville Walsh

foliage looked similar enough to the Spiny Rice-flower to warrant a closer inspection. This revealed the spiny stems so a sample was sent to the Royal Botanic Gardens in Melbourne for identification. It could have been an outlying population of the Spiny Rice-flower, a positive development for that species, but instead it was to be an even more exciting discovery.

Recovery work on the Spiny Rice-flower has increased knowledge of its biology and distribution. This recovery work will now expand to include the Wimmera Rice-flower. Meetings have been held on site to discuss the short and long term management requirements for the population. These have included neighbouring landholders, and representatives from the Department of Sustainability and Environment (DSE), Royal Botanic Gardens Melbourne, Parks Victoria, local Shire, Country Fire Authority and the Australian Native Plants Society.

The site of the Wimmera Rice-flower population is also an excellent example of remnant grassland vegetation in the region, with a good diversity of other species present. Fortunately it has survived the clearing and degradation that has occurred on many other roadsides. Initial assessments have determined that the major threat to the site would be accidental or intentional clearing of the roadside vegetation and/or substantial disruption to the intact grassland community there. There is also potential risk to plants found within the table drain and a firebreak along the fence. Practices that need to be avoided on the roadside include works and maintenance, herbicide use, soil disturbance and inappropriate grazing and fire regimes. The spread of weeds is also a threat, with numerous sources adjacent to the site. Weed control will need to be maintained



Pimelea spinescens subsp. *pubiflora* – the 'Wimmera Rice-flower'. Photo: Jeff Blackman

but the intact nature of the grassland community should provide some natural competition and therefore protection from invasion.

There is a range of actions being implemented by DSE and other parties involved, which will eventually form part of the Recovery Plan. This includes searching for new populations,

identifying potential habitat, liaison with stakeholders, propagation of plants, establishment of a seed bank collection and monitoring to increase understanding of the species. Genetic studies will be undertaken on populations of both subspecies. The Wimmera Rice-flower will become part of the Wimmera Threatened Flora Project, which is funded federally by Natural Heritage Trust via the Wimmera Catchment Authority.

Protecting a coastal icon: a cooperative approach to controlling Pandanus dieback in northern New South Wales

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Introduction

In northern New South Wales (NSW) the coastal Pandanus (*Pandanus tectorius*) is an iconic feature, growing on exposed coastal headlands and along beaches north of Port Macquarie.

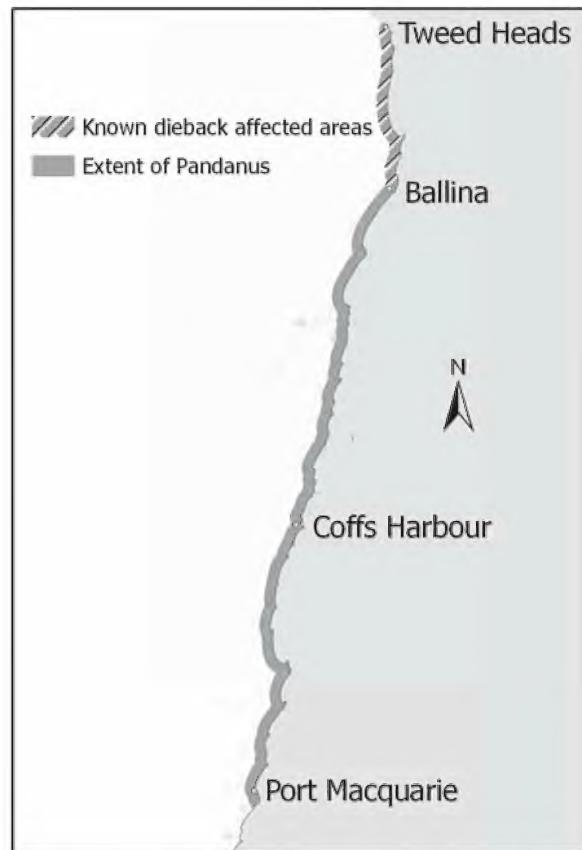
Although not currently listed as a threatened species, Pandanus is a key species of the high conservation value coastal dune and headland vegetation. This includes littoral rainforest, which is listed as an endangered ecological community under the NSW *Threatened Species Conservation Act 1995*.

Pandanus is a plant of cultural importance to Aboriginal people who know it as 'breadfruit', although it is unrelated to plants of the same name from Asia and the South Pacific. When the massive fruit ripens, the segments loosen and fall. The sweet pulp can then be eaten raw or roasted in hot sand.

Pandanus plants in NSW have recently become threatened by planthopper dieback. This dieback is caused by an infestation of the 'flatid', or planthopper *Jamella australiae*. The planthopper is native to north Queensland where it is controlled by natural predators that are not present in NSW or South-East Queensland. The insects produce a sticky substance called honeydew, which encourages mould growth. This makes leaves drop and kills the tree's growing points, eventually causing the death of the entire tree.

Since about 1990, severe dieback has occurred in Pandanus in South-East Queensland from Noosa to Coolangatta. In Noosa National Park 50% of the population was lost at the height of infestation. Control measures began in 1995 and were considered successful by 1998, following establishment of the planthopper's natural predator, a parasitic wasp.

Pandanus dieback was first detected in NSW in March 2004 and has now been found between Tweed Heads and Ballina,



Distribution of Pandanus (P. tectorius) in New South Wales. T. Perry, DEC

with an isolated occurrence at Yamba. Several trees within this region have already died and there is potential for the infestation to spread. Local area extinctions could occur if infestations are left unchecked.



(left to right): Pandanus with sooty mould and adult planthoppers; Planthopper eggs. Photos: C. Easton, Tweed Shire Council

A cooperative management approach

A Pandanus Planthopper Working Group was formed in November 2004 to tackle this urgent issue, with representatives from local and state government. This included Tweed, Byron, Ballina, Richmond Valley and Clarence Valley Councils, Department of Lands, Department of Primary Industries and Department of Environment and Conservation (DEC). The achievements of this working group to date are:

- development of a draft management strategy;
- development of a community information brochure;
- development of a standard survey methodology, training and supporting information;
- a coordinated approach to monitoring and treatment of dieback;
- a successful application for funding to the Northern Rivers Catchment Management Authority, resulting in funding of \$40 000 for survey and treatment of Pandanus Dieback;
- an information day for land managers and members of the community;
- completion of surveys on DEC estate and in local government areas;
- investigation into approvals required for the introduction of a wasp into NSW for biological control of the planthopper;
- investigation into listing the planthopper as a declared pest under the *Plant Diseases Act 1924*, and
- seeking listing of Pandanus as a 'vulnerable species' under the *Threatened Species Conservation Act 1995*.

A second working group has been more recently formed to tackle Pandanus dieback in the southern half of the species' NSW geographical distribution.

Survey

A survey was conducted to assess the extent of Pandanus dieback in northern NSW. The survey included:

1. the location of Pandanus in the region;
2. measures of tree health & status, and
3. the presence/absence of the Pandanus planthopper and measures of abundance.

A survey manual was developed. This included photographs to allow staff to easily identify levels of infestation of the planthopper (light, moderate and heavy) and levels of health of affected trees (healthy, poor, very poor or dead). The manual also included pictures of other insects such as mealy bugs, which may be mistaken for planthoppers. Wherever possible, survey records were entered directly into hand held computers linked to GPS to allow for ease of data capture and mapping.

The data from this survey showed that there are 2058 Pandanus on DEC estate within the Northern Rivers Region and a total of approximately 5000 on other lands.



Conducting chemical control by stem injection.
Photo: C. Easton, Tweed Shire Council



A stand of healthy Pandanus. Photo: R. Gates

Of this 1531 occur within the littoral rainforest of Broken Head Nature Reserve. The planthopper was detected on DEC estate at Cape Byron, and on council lands in Tweed, Byron, Ballina and Clarence Valley council areas.

Control

Control Priorities

The known infestations around Lennox Head and Byron Bay present an enormous threat to the largest healthy natural population of Pandanus on the north coast in Broken Head Nature Reserve.

Funding was obtained from the Northern Rivers Catchment Management Authority to undertake a 12 month survey and treatment program in Ballina, Byron and Richmond Valley shires including creation of a buffer around Broken Head Nature Reserve. This involves treating both infected and non-infected trees within a ten-kilometre radius of the reserve.

Control methods

There are potentially three methods of control:

Chemical control: involves insecticide control either by stem injection or over-spraying or a combination of both.

Physical control: by stripping affected leaves from the tree to allow healthy regrowth and disposing of leaves in sealed bags to prevent wind spreading the planthoppers and eggs.

Biological control: The planthopper's predator, a wasp native to north Queensland, has been released in South-East Queensland. This has been successful in controlling Pandanus dieback. The viability of importing this wasp into NSW is currently being investigated.

Timeframes in the implementation of surveys and treatment are critical. In the cooler months the effectiveness of the systemic insecticide is greatly reduced. The insect can complete its lifecycle within 8 weeks and therefore the imminent death of trees can occur in this time.

Community Education

A brochure has been produced to raise community awareness of this issue. This is of particular importance in the nursery and landscaping businesses. The community is being asked to only use locally grown Pandanus, and to inspect them carefully for any signs of infestation before planting.

Monitoring

Locations where planthoppers have been found will be monitored every three months to determine tree health and abundance of planthoppers. Bi-annual surveys will be conducted on DEC estate to measure the status and health of the overall Pandanus population. Photo monitoring points will be established at key locations to assist in the monitoring and evaluation of control measures.

Conclusion

It is hard to imagine the north coast of NSW without Pandanus. Faced with the possibility of local extinctions within three to eighteen months if the dieback was untreated, land managers have acted to put in place control and monitoring systems. The priority to date has been to minimise deaths of trees that were already infected. This will shortly be followed by measures to stop the spread of the dieback to uninfested areas, particularly Broken Head Nature Reserve.

The scope for collaborative biodiversity conservation on church-owned land

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The mainstream Christian denominations in Australia (the Catholic, Anglican and Uniting Churches) own significant areas of land. Some of their properties contain ecologically significant features, such as remnant vegetation that may include threatened ecological communities, populations and species. Monasteries and cemeteries are already recognised in ecological literature as sometimes retaining the last areas of remnant vegetation in extensively altered regions such as urban and cropping zones. Some Church schools may also retain remnant vegetation as the land originally deeded for this purpose is often much larger than the area occupied by the school.

While in some cases, government authorities and/or field naturalist groups will know of significant remnant vegetation held by the Church, the Church itself may have little, if any, idea of what biological assets reside on its land.

Churches' capacity to protect their biological assets

How well equipped are churches to manage their land to maintain and protect natural values?

Ecological awareness within the Church has been growing, but is a relatively recent phenomenon. There is an expanding array of pro-environmental policies and teachings, but while religious organisations are increasingly effective at producing policies, most struggle to implement them. Much depends on the knowledge and interest of influential figures within the institutions. Some denominations or factions within them remain opposed to any significant ecological policy implementation.

My research has not revealed an effective process for assessing ecological values on Church lands. Some Church organisations promote voluntary environmental audits of their properties, e.g. energy use, waste management. Some include basic ecological assessments that can be undertaken by non-experts to flag areas warranting specialist investigations. However, compliance with this process is low and patchy, and it is largely restricted to the Catholic Church, although the Anglican Environment Commission intends to implement a similar scheme.

Another significant constraint is the relatively low level of ecological literacy within Church organisations. This is not unique to churches; how many other non-environmental organisations could be expected to know if their property was of particular ecological importance?

Institutional structures relating to land management also appear to be a barrier to converting organisational environmental policies into practice. Indeed, attempts to undertake a comprehensive ecological audit of Church estate quickly encounter the problem that the churches themselves don't know exactly what property they own and under what arrangements, let alone whether it has nature conservation significance.

Examples of conservation outcomes on Church land

Despite the above constraints, the overall increase in pro-environmental policy and general ecological awareness within churches in Australia is seeing some interesting outcomes for land management. Examples include:

- involvement in Landcare and related revegetation schemes through plant propagation, distribution and planting;
- conservation of identified significant remnant vegetation on Church lands through various arrangements ranging from formal legal agreements to informal commitment to its conservation (e.g. see CCSERAC 1993, 1998);
- bush regeneration or at least ecological weed control activities on Church properties;
- involvement in construction of fauna habitat boxes for use on and off-site;



Uniting Church cemetery, Campbell Town, Tasmanian Central Highlands. The church obtained an Envirofund grant to control weeds that were threatening several grassland plants.

Photo: Greening Australia



Endangered Natural Temperate Grassland at the Australian Centre for Christianity and Culture, Barton, Canberra. The grassland was saved through the efforts of the local Anglican Bishop, Friends of Grasslands and Environment ACT. Photo: Helena Mills

- regular ecological monitoring of remnant flora and fauna, including reporting to state government environment agencies;
- institutional sponsorship of various conservation and ‘greening’ schemes by Church organisations, particularly schools, and
- joining with the broader environmental lobby to advocate conservation of particular areas.

How can ecological practitioners assist?

The broader community of ecological practitioners can play a key role in promoting the management of Church-held biodiversity assets for conservation, especially through helping those religious organisations that have adopted a pro-environmental stance to bridge the divide between policy and practice. Whilst some organisations are very insular and disinclined to engage with those outside the membership of their faith, most of the mainstream churches, at least at an official level, are much more open to outside expert assistance, and some actively seek it.

A major contribution can be to fill the knowledge gap by offering to survey land for significant biota, or co-ordinating a survey by local field naturalist or other experienced groups. Some religious groups may have the funds to pay for professional surveys, but most of the mainstream churches are unlikely to have the resources or inclination to do this. Where external funding is needed, ecological practitioners can assist in lobbying for various environmental grants.

If we or others can identify assets such as remnant vegetation, we can then identify pest plants and animals or processes that may threaten biodiversity values on and

off-site (for example see McGlone 2004) and also recommend or obtain advice as to appropriate management strategies. Most vegetation management plans will require some capital expenditure to prepare and implement, so again, knowing which agencies to approach for assistance and the range of grants that are available can be very useful.

Where significant biodiversity assets are discovered, we can provide a link between the Church authorities and government agencies that may be able to offer management support in exchange for the Church agreeing to conserve particular areas. For example, the Catholic Diocese of Wilcannia-Forbes (roughly the westernmost half of NSW) is in discussion with the Department of Environment and Conservation regarding a biodiversity survey of Church lands and the scope for formally conserving significant assets. The Department is keen to work with any other Church groups with substantial land holdings that may have significant environmental values.

Perhaps the highest priority is to ensure that key decision-makers within the religious organisation are informed if there are significant biodiversity assets associated with their land, and if so, what action is required to conserve them. Lack of knowledge of such assets is a threat, in that they can be destroyed or degraded through simple ignorance.

The greening of religion a move to better conservation outcomes

There is a global phenomenon known variously as ‘the greening of religion’ or ‘the greening of God’ (e.g. Finlay & Palmer 2003). This entails a shift within most world religions such that modern ecological understanding is given greater emphasis – a shift now widely acknowledged as capable of

motivating radical behavioural change. This phenomenon extends to the Christian religion, including the mainstream denominations within Australia (e.g. see Leal 2004).

There are already examples of significant conservation outcomes being achieved here where Church leaders have been informed of biodiversity assets and their importance. Sometimes this occurs through regulatory development assessment processes and professional ecological surveys, but in many other situations, without intervention by ecologically knowledgeable people, Church organisations will remain ignorant of the ecological assets in their care. Whilst there are also examples of information being insufficient to prevent deliberate destruction of biodiversity assets through the sale or mismanagement of land, the growth of ecological policy and awareness within the

Church suggests that we can expect to see at least some growth in the application of the Churches' environmental policies to their own land, and more broadly—a trend that should contribute to better conservation outcomes.

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Public consultation and the listing of threatened ecological communities

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The Australian Government encourages public input into the process of listing threatened ecological communities under the Australian Government's environment legislation, the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Nominations

Under the EPBC Act anyone can nominate a threatened ecological community for listing. Nomination forms, guidelines and information on the listing process can be found at <http://www.deh.gov.au/biodiversity/threatened/nominations/index.html>.

If you are planning to nominate an ecological community for listing under the EPBC Act, you are welcome to contact the Ecological Communities Section for advice and tips on how to prepare a nomination. Contact Peter Komidar on (02) 6274 2317 or at peter.komidar@deh.gov.au.

Public Comments

All nominations are released for public comment on the internet for a period of two months. You can view these nominations at <http://www.deh.gov.au/biodiversity/threatened/nominations/open-communities.html>.

Comments will still be accepted beyond the two month timeframe, where practical. To view nominations for which the public comment period has officially ended, but for which input may still be accepted, go to <http://www.deh.gov.au/biodiversity/threatened/nominations/closed-communities.html>.

The EPBC Act specifies that, when making a decision whether to list an ecological community, the Minister can only take into account the conservation status of that ecological community. Comments relating to potential social and economic implications of listing may not be considered. This information, however, can be very useful in the development of appropriate information and support products to assist affected stakeholders at the time of listing.

For further information on listing ecological communities, the Threatened Species Scientific Committee and the EPBC Act, contact the Ecological Communities Section, access the website at <http://www.deh.gov.au/biodiversity/threatened/index.html>, or subscribe to our quarterly newsletter, *Communities for Communities* (see the advertisement inside the back cover of this bulletin for details).

Report from the New Zealand Plant Conservation Network

Bec Stanley

Promoting the New Zealand Plant Conservation Network has met with great success this year with our newsletter *Trilepidea* (now over 2 years old) being read by over 800 people every month and our website with over 12,000 visitors each month. The website now displays photos of 80% of the NZ flora with botanists from all over the country willingly donating their images to the site. This year the website hosted a 'New Zealand's favourite plant' poll with Cook's Scurvy Grass (*Lepidium oleraceum*) the 2005 winner. Cook's Scurvy Grass is now critically endangered and has disappeared from the mainland over the entire country except for one place in the South Island. This has been a catastrophic decline for a plant Captain Cook collected 'by the boatload' to prevent his crew getting scurvy (hence the name).

Our 3rd annual conference was held in August in Christchurch with the theme 'Restoring our threatened plant life – empowering our community'. Over 100 people attended with talks on a variety of subjects such as specific threatened plant projects, general plant conservation and the Millennium Seed Bank at Kew. Workshops were held on the cultural use of plants and fungi, Targets 5 and 8 of the Global Strategy for Plant Conservation, New Zealand fungi and on the cultivation of native plants. Field visits were made to a specialist threatened plants Nursery (Motukarara) and Kaitorete Spit.

Inaugural Plant Conservation awards were made by the Network at a ceremony during the conference, with awards for councils, schools, and nurseries. There were also two individual awards, one for Peter de Lange, plant conservation scientist at the Department of Conservation and another, the Lifetime Achievement award, presented to David Given for his 30 year career promoting and researching



threatened plants. David was the first person in New Zealand to develop threatened plant lists as a basis for prioritising effort for conservation. David was a tireless presenter, lobbyist and networker at international conferences and with international agencies for plant conservation. Sadly David passed away in November.

The first phase of the Network's marae-based plant training courses was completed this year. The purpose of these courses is to provide training to Maori in a range of plant conservation activities. These information gathering meetings discussed possible course topics e.g. plant identification, restoration techniques, taonga species, sourcing funding for restoration projects, caring for covenants and wetlands. Maori representatives will also assist with course development, the next phase of the project.

For more information contact the New Zealand Plant Conservation Network, email: info@nzpcn.org.nz.

Vale David Given – plant conservation pioneer



Dr David Given FLS (1943-2005), a pioneer of the New Zealand and global plant conservation movement, died on 27 November 2005, after an eighteen-month battle with cancer.

David had been in remission until less than a month before his death, and was active at last August's successful conference of the New Zealand Plant Conservation Network. In mid-October he was in Sydney for the commercial

launch of the Wollemi Pine, and caught up with some of his Australian friends and colleagues.

David authored over 200 scientific papers and four books. As a plant systematist he specialised in ferns, and in the mainly New Zealand daisy genus *Celmisia*, which also occurs in Australia. He had a strong affinity for the Chatham Islands, and was engaged in a major Marsden Funded research programme to determine the age, origin and evolution of the Chathams' flora.

He spent nearly 30 years as a research scientist with the old DSIR (New Zealand's version of CSIRO). He then moved to

Lincoln University, teaching landscape ecology, conservation biology, nature conservation and ethnobotany. At Lincoln, he was also one of the founders, and Manager, of the Centre for Nature Conservation (now the Isaac Centre). For this work and in recognition of his international stature in environmental management and conservation, he was appointed an Associate Professor in February 2000.

A pioneer of scientific plant conservation, first in New Zealand and then globally, David was a tireless presenter, lobbyist and networker at international conferences and with international agencies. He was deeply involved with IUCN – the World Conservation Union – and its Species Survival Commission (SSC). He was Chair of the SSC Plant Conservation Committee from 1997 to 2004, and of the SSC Pteridophyte (Fern) Specialist Group for several years. He also contributed to the work of other specialist groups, including those on Re-introduction, Conservation Breeding, and Sustainable Use, and to the work of Botanic Gardens Conservation International.

In 1995 David was awarded the Loder Cup by the NZ Minister of Conservation, for services to plant conservation, and at the IUCN World Conservation Congress in Bangkok in 2004 was given the SSC's Sir Peter Scott Award for Conservation Merit. In 2005 he was awarded the New Zealand

Ecological Society's celebrated *Te Tohu Taiao* Award for Ecological Excellence, and a Lifetime Achievement Award by the NZ Network for Plant Conservation (NZ PCN), which he had helped found.

David's job at the time of his final illness was as Botanical Services Curator with Christchurch City Council – a more significant post than it sounds to the Australian ear (tuned as we are to three tiers of Government). He was in fact Curator of Christchurch Botanic Gardens, a role that he described as a 'dream position'.

David was a member of the Australian Network for Plant Conservation (ANPC) from its foundation in 1991, and attended several of our conferences. He was Vice-President of our National Management Committee for two terms, and was a consistent source of encouragement and international experience for plant conservation in this country.

David will be missed in both our countries and around the world. The ANPC sends its sympathy to his wife Karina, and to his children and grandchildren.

Bob Makinson and Jeanette Mill, with acknowledgements to Peter J. de Lange (NZPCN), BGCI, and IUCN.

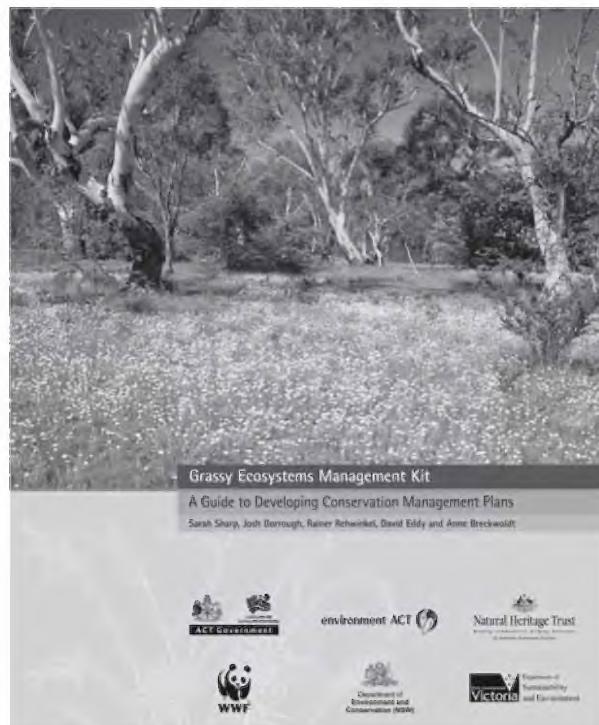
Resource Kit Review

Grassy Ecosystems Management Kit

Sharp S., Dorrough J., Rehwinkel R., Eddy D. and Breckwoldt, A. 2005. *Grassy Ecosystems Management Kit: A Guide to Developing Conservation Management Plans*, Environment ACT, Canberra. ISBN: 0 642 60340 5. Price \$30 (incl. GST) and \$10 postage. To order: www.environment.act.gov.au/nativeplantsandanimals/grassystemsmangementkit.html.

Grassy ecological communities include native grasslands, grassy woodlands, secondary grasslands and native pastures. Many remnants of these communities are on private lands. These can be valued in various ways. They have intrinsic, ecological, social, economic, scientific, educational, cultural, recreational and aesthetic values. But they have traditionally been sacrificed to agricultural and plantation forestry developments, and urban and rural residential development and associated infrastructure. Their ecological value has only been recognised over the last 20 years or so.

Although today various grassy communities are listed as threatened under Australian Government and state and territory legislation, they continue to be impacted upon by invasive exotic species, inappropriate management, and other threats. This *Grassy Ecosystem Management Kit* aims to help people to better manage grassy ecosystems on their land for their ecological values, taking into account existing land uses.



This kit is a most welcome publication. It will help and encourage landholders, land managers and environmental groups to develop management plans aimed at restoring remnant grassy communities towards their natural state. It will be most useful for landholders and land managers working at the property scale where management plans are not yet in place, or where these do not sufficiently identify and respond to identified threats. It will also help them to develop credible management plans to show donors and lenders in support of applications for assistance. But even where recovery and management plans do exist, this kit will enable changing management priorities to be identified and work plans modified as needs arise. The kit is also much needed, as the enormity of the challenges involved in restoring grassland communities can be quite overwhelming in some seasons.

The main advantages of this kit over others are that it is specific to grassland communities, succinct, very hands-on, well structured, and written in plain English. It comes in a ring-binder folder so that it can be used adaptively. It includes:

- a step-by-step workbook explaining how to develop a management plan with prompts for the materials that are needed for each step;
- recording sheets for developing the plan and monitoring its implementation;
- a case study of the Crace Grassland Reserve in Gungahlin, Canberra, and its management plan;
- a list of common grassy ecosystem species and cross-references to information, photographs and illustrations within the kit and a couple of other reference books;
- useful background information and the WWF Australia booklet *Managing Native Grassland: A Guide to Management for Conservation, Production and Landscape Protection* by David Eddy;

- fine illustrations by Michael Bedingfield;
- a glossary of terms;
- a reference list of field guides, management guidelines and other toolkits;
- contact information for government agencies and environmental organisations, and
- a CD of the kit as pdf files.

The workbook takes readers clearly and carefully through a step-by-step management cycle, with the necessary worksheets provided. Steps 8–9 in the workbook and David Eddy's full-colour booklet contain useful descriptive, explanatory and practical information about how to manage grassland communities over time. Whilst the kit does not assume prior biological knowledge, land managers will need to become familiar with native and exotic grassland species to make optimum use of the kit.

The kit will inspire and encourage readers who value Australia's disappearing grassland communities. It provides a solid foundation for long-term learning. There is also an opportunity for the kit to be expanded in future so that grassland communities can be managed explicitly for their full spectrum of values, so that the political, economic and social drivers threatening these ecosystems can be better managed as well.

The kit has been produced as a collaborative project involving staff in Environment ACT, the NSW Department of Environment and Conservation, and the Victorian Department of Sustainability and Environment. The Australian Government's Natural Heritage Trust/WWF Grassy Ecosystems Grants Scheme provided funding.

Hanna Jaireth PhD
ACT Parkcare volunteer

Research Roundup

Barrett, L.G., He, T., Lamont, B.B. and Krauss, S.L. (2005). **Temporal patterns of genetic variation across a 9-year-old aerial seed bank of the shrub *Banksia hookeriana* (Proteaceae).** *Molecular Ecology* 14(13): 4169-4179.

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Cameron, M. (2006). **Nesting habitat of the glossy black-cockatoo in central New South Wales.** *Biological Conservation* 127(4): 402-410.

Chalmers, A., McIntyre, S., Whalley, R.D.B. and Reid, N. (2005). **Grassland species response to soil disturbance and nutrient enrichment on the Northern Tablelands of New South Wales.** *Australian Journal of Botany* 53(6): 485-499.

Cook, G.D., Williams, R.J. and Banks, J.C.G. (2005). **Sustainable harvest rates of ironwood, *Erythrophleum chlorostachys*, in the Northern Territory, Australia.** *Australian Journal of Botany* 53(8): 821-826.

Cousins, S.A.O. (2006). **Plant species richness in midfield islets and road verges – the effect of landscape fragmentation.** *Biological Conservation* 127(4): 500-509.

Farnsworth, E.J., Klionsky, S., Brumback, W.E. and Havens, K. (2006). **A set of simple decision matrices for prioritizing collection of rare plant species for *ex situ* conservation.** *Biological Conservation* 128(1): 1-12.

Griffiths, A.D., Schult, H.J. and Gorman, J. (2005). **Wild harvest of *Cycas arnhemica* (Cycadaceae): impact on survival, recruitment and growth in Arnhem Land, northern Australia.** *Australian Journal of Botany* 53(8): 771-779.

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Korcynskyj, D. and Lamont, B.B. (2005). **Grasstree (*Xanthorrhoea preissii*) recovery after fire in two seasons and habitats.** *Australian Journal of Botany* 53(6): 509-515.

Marrinan, M.J., Edwards, W. and Landsberg, J. (2005). **Resprouting of saplings following a tropical rainforest fire in north-east Queensland, Australia.** *Austral Ecology* 30(8): 817-826.

Mathews, S. and Bonser, S.P. (2005). **Life histories, ecological tolerance limits, and the evolution of geographic range size in *Eucalyptus* (Myrtaceae).** *Australian Journal of Botany* 53(6): 501-508.

McDougall, K.L., Hobbs, R.J. and Hardy, G.E. St J. (2005). **Distribution of understorey species in forest affected by *Phytophthora cinnamomi* in south-western Western Australia.** *Australian Journal of Botany* 53(8): 813-819

McIntyre, S., Martin, T.G., Heard, K.M. and Kinloch, J. (2005). **Plant traits predict impact of invading species: an analysis of herbaceous vegetation in the subtropics.** *Australian Journal of Botany* 53(8): 757-770.

Moseby, K.E. and Read, J.L. (2006). **The efficacy of feral cat, fox and rabbit exclusion fence designs for threatened species protection.** *Biological Conservation* 127(4): 429-437.

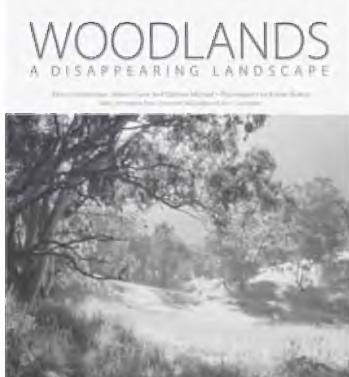
Pickering, C.M. and Barry, K. (2005). **Size/age distribution and vegetative recovery of *Eucalyptus niphophila* (snowgum, Myrtaceae) one year after fire in Kosciuszko National Park.** *Australian Journal of Botany* 53(6): 517-527.

Woldendorp, G. and Keenan, R.J. (2005). **Coarse woody debris in Australian forest ecosystems: A review.** *Austral Ecology* 30(8): 834-843.

Information Resources and Useful Websites

Woodlands: A Disappearing Landscape

*D. Lindenmayer, M. Crane, and D. Michael. Sept 2005,
CSIRO Publishing*



Australia's little known woodlands once covered huge areas of the eastern side of our continent. In many cases only small remnant patches of some types of woodland survive. Understanding and appreciating woodlands is an important way forward for promoting their sustainable

management and conservation. This book explains with lucid text and spectacular photographs the role that woodlands play in supporting a range of native plants and animals that has existed there for millions of years. 160 pages, Hardback, ISBN: 0643090266, \$39.95. Available from CSIRO Publishing: <http://www.publish.csiro.au>.

Grassy Ecosystems Management Kit A guide to developing Conservation Management Plans

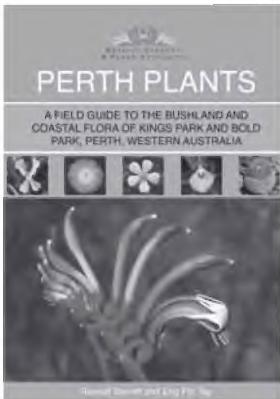
*S. Sharp, J. Dorrough, R. Rehwinkle, D. Eddy and A. Brekoldt.
2005, Environment ACT.*

A useful guide that is designed to assist in the assessment and management of grassy vegetation. The focus is on implementing the best management practices to maximise the natural functioning of the remnant ecosystem. It is suitable for use by regional planning groups, Landcare groups and individual landholders or land managers. For further information see review on page 27.



Perth Plants: A field guide to the bushland and coastal flora of Kings Park and Bold Park, Perth, WA.

R. Barrett and E. Pin Tay, December 2005, Botanic Gardens and Parks Authority, Perth



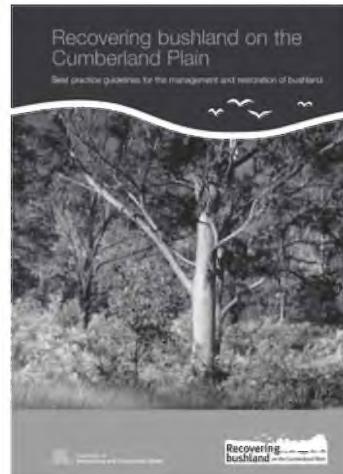
This field guide provides a comprehensive photographic guide to all plants known to occur in the bushlands of Kings Park and Bold Park, both native plants and naturalised weeds. Illustrated with 2,500 photographs and individual species distribution maps. 756 species are included, representing approximately one quarter of all the plants in the greater Perth district, and

one tenth of all species known for the south-west of Western Australia. While some species have only a narrow distribution around Perth, many are widespread throughout south-west Western Australia and beyond. This field guide is an essential reference for anyone interested in the plants of south-west Western Australia, and particularly the Swan Coastal Plain. 416 pages. RRP: \$44.95. Enquiries: Ph: (08) 9480 3600, email: enquiries@bgpa.wa.gov.au, <http://www.bgpa.wa.gov.au/home/index.html>.

Recovering bushland on the Cumberland Plain: best practice guidelines for the management and restoration of bushland

2005, Department of Environment and Conservation (NSW)

These guidelines have been developed to provide theoretical and practical guidance to land managers who have remnants of Cumberland Plain bushland on their properties. The guidelines will assist agricultural enterprises to manage endangered Cumberland Plain ecological communities on farmland and guide councils and other land managers on restoration of these communities within rural and urban lands. Alongside the guidelines, four demonstration sites have been developed to provide land managers with practical on-ground examples of many of the restoration techniques outlined in the guide. Further information on the publication and demonstration sites can be found at: http://www.nationalparks.nsw.gov.au/npws.nsf/Content/cumberland_plain_management_guidelines.



New Guides to research and resources for Native Vegetation management at a regional and property scale

2005, Greening Australia

Native Vegetation and Regional Management: A guide to research and resources and *Native Vegetation and Property Management: A guide to research and resources*. These guides will lead you quickly and easily to the best information currently available about native vegetation management. Comes with a two CD set which contains electronic versions of these publications and also over 300 research publications from other organisations. Further information and order forms for these FREE guides are available from: <http://www.greeningaustralia.org.au>.

Grants for environment and heritage - a guide

2005, Australian Government Department of the Environment and Heritage

This new guide has been developed to help guide people through the maze of federal environment grants available. The guide covers programs such as Envirofund under NHT and the Grants to Voluntary Environment and Heritage Organisations. It directs groups and individuals to further information about each program and where to find detailed criteria and application forms. Available to download via <http://www.deh.gov.au/programs/index.html>.



Wetlands Help-line website

<http://www.mainstream.com.au/Helpline/front.htm>

This website is designed to help people with an interest in the conservation and wise use of wetlands to access information and seek out programs and organisations that offer expertise and help in this field.



The Volunteer Coordinators Network Manual

<http://aabr.org.au/vcn/index.htm>

The VCN Manual is a best practice guide for not-for-profit organisations, to assist them in managing their long term environmental volunteer programs.

This Manual has been developed by the Volunteer Coordinators Network (Natural Areas). The VCN is an information sharing



network of staff from government and non-government organisations throughout Australia who coordinate volunteer programs.

This Manual has 16 sections covering all aspects of managing environmental volunteer programs. Click on the chapter headings on the left of the website to take you to the relevant section. Most sections contain detailed information, case studies and links to other sites.

ANPC Workshops

ANPC workshop on grassy ecosystems in the ACT – preliminary notice

29-30 November 2006

The ANPC's application to the 2005-06 ACT Environment Grants was successful, and we have received a small grant to run a workshop on 'facilitating community involvement in the conservation and rehabilitation of native grassy ecosystems'.

The funding application was supported by the following key groups involved in grassland management, conservation and rehabilitation in the ACT:

- Environment ACT – as a contributing project partner;
- Friends of Grasslands (FOG);
- Molonglo Catchment Group;
- Ginninderra Catchment Group Inc;
- Southern ACT Catchment Group;
- Greening Australia ACT & SE NSW, and
- Monaro Grassland Conservation Management Network.

This two day workshop will be held at the end of November 2006, when grasses are in seed. Consultation with the above groups, and other interested groups or individuals, will determine the structure and content of the workshop, which will include presentations, discussions, field visits and field identification of grasses and other plants.

Who do we want to participate?

Anyone interested in or working in the conservation, management or rehabilitation of grassy ecosystems is welcome to participate. We encourage the involvement of Landcare coordinators and volunteers, other community groups such as 'Friends of ...' groups, landholders, community liaison officers, environmental consultants,

government agency staff, staff from nearby NSW CMAs and local government, industry (e.g. the airport, power and water suppliers) and other interested individuals.

One of the aims of ANPC workshops is to encourage people with a broad spectrum of expertise and interests to mix and get to know each other, so they can strengthen understanding of other viewpoints, exchange experiences and skills, establish and extend networks and build trust.

'Scholarships' for community volunteers – seeking sponsors

One of the project aims is to develop skills of community members who could then be available for on-ground rehabilitation projects. This includes training, encouraging and supporting the volunteer community, on which we all depend heavily.

As the ANPC needs to charge registration fees for its workshops to cover its costs, we will be approaching organisations (such as government agencies, CMAs, local government, corporations) to sponsor a number of scholarships to cover the fees of some community volunteers. Suggestions on potential sponsors would be welcome.

Further details on this workshop will be provided on the ANPC website and via the ANPC email list as it evolves.

Sally Stephens, ANPC. Email: anpc-sally.stephens@deh.gov.au

Conferences and Workshops

Catchment and Natural Resource Management 2006: Learning to better manage our catchments

23-24 February 2006, Albury Conference Centre, Albury NSW

A two-day national conference looking at the most recent developments in catchment and natural resource management. Further information: <http://www.halledit.com.au/conferences/cnrm/index.htm>.

Fruit and seed morphology workshop

14-16 March 2006, University of Sydney's Plant Breeding Institute, Cobbitty, NSW

The NSW Seed Bank (Mount Annan Botanic Garden) is hosting a fruit and seed morphology workshop presented by Dr Wolfgang Stuppy, a seed morphologist from the Millennium Seed Bank (Royal Botanic Gardens Kew, UK). This workshop is targeted at staff or students currently working in seed collection, seed banking, seed research or germination testing. For further information contact Amelia Martyn, Seed Research Officer, Mount Annan Botanic Garden, Phone: 02 4634 7968. Email: amelia.martyn@rbgsyd.nsw.gov.au.

Veg Futures 2006: The conference in the field

19-23 March 2006, Albury-Wodonga

Veg Futures 2006 will be a participatory conference on the role of vegetation in productive landscapes: from policy to regional planning and into practice. *Veg Futures 2006* will provide an opportunity for anyone involved in vegetation management at the regional level to have their say, pass on their knowledge and experience to others, and pick up some new ideas.

This is a conference for tree planters, regional planners, bush managers, policy makers, direct seeders, researchers, seed collectors, extension agents, botanists, teachers and trainers, bush regenerators and sustainable farmers and graziers.

Veg Futures 2006 will tackle the 'big questions' about native vegetation in Australia including:

- what is the role and value of vegetation in the regional landscape?
- who pays for vegetation management?
- how do we balance competing demands for conservation and production?
- what are we doing about the threats to native vegetation (action and on-ground works)?
- how do we know if we are making a difference (monitoring and evaluation)?

For further information go to:

<http://www.greeningaustralia.org.au>.

Australasian Bushfire Conference

6-9 June 2006, Queensland

The conference theme is 'Life in a Fire-Prone Environment: Translating Science into Practice' and the event aims to provide a forum to share new ideas on the complex issues of bushfire management. Further information: <http://www.bushfire2006.com/>.

15th Australian Weeds Conference

24-28 September 2006, Adelaide Convention Centre

The conference theme is 'Managing Weeds in a Changing Climate.' Further information: <http://www.levin.com.au/15AWC2006/>.



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<http://www.deh.gov.au/biodiversity/threatened/publications/communities-newsletter/>*

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ANPC PLANT CONSERVATION TECHNIQUES MANUAL NOW ON CD!

Plant Conservation: approaches and techniques from an Australian perspective

Edited by: Claire L Brown,
Fiona Hall & Jeanette Mill.
Australian Network for Plant
Conservation (ANPC), 2003.

This manual covers a comprehensive range of topics to be considered when undertaking conservation and ecological rehabilitation. In his foreword, Carl Binning writes: 'The manual draws on the expertise of some of the leading exponents of practical conservation in Australia. The techniques and methods have been tested and refined by a broad network of plant conservation practitioners.'

35 authors contributed to the manual, which includes 39 chapters contained in 11 modules:

- Principles and Ethics of Conservation
- References and Resources
- Conservation Instruments and Initiatives
- Getting Started: Information for Conservation
- Conservation in the Field
- Rehabilitation and Translocation
- Monitoring and Adaptive Management
- Ecological Communities
- Propagating Threatened Flora for Conservation
- Cryptogams
- Training

Context boxes, glossaries, key reading, cross-referencing, reference lists, web sites and author contact details complement the detailed information contained in each chapter.

The manual is now available on CD for \$30. Stocks of the big ring-binder are running low; if you prefer this version, order now or risk missing out!

To Obtain Your Copy

Ring-binder price: \$55 (+ \$10 postage & handling within Australia). Price includes GST.
CD price: \$30 (including GST, postage & handling).

Order forms available from <http://www.anbg.gov.au/anpc/books.html> or contact the ANPC National Office on phone 02 6250 9509, email anpc@deh.gov.au.



Australasian Plant Conservation

BULLETIN OF THE AUSTRALIAN NETWORK FOR PLANT CONSERVATION

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